APRIL, 1926

Railway Engineering and Maintenance

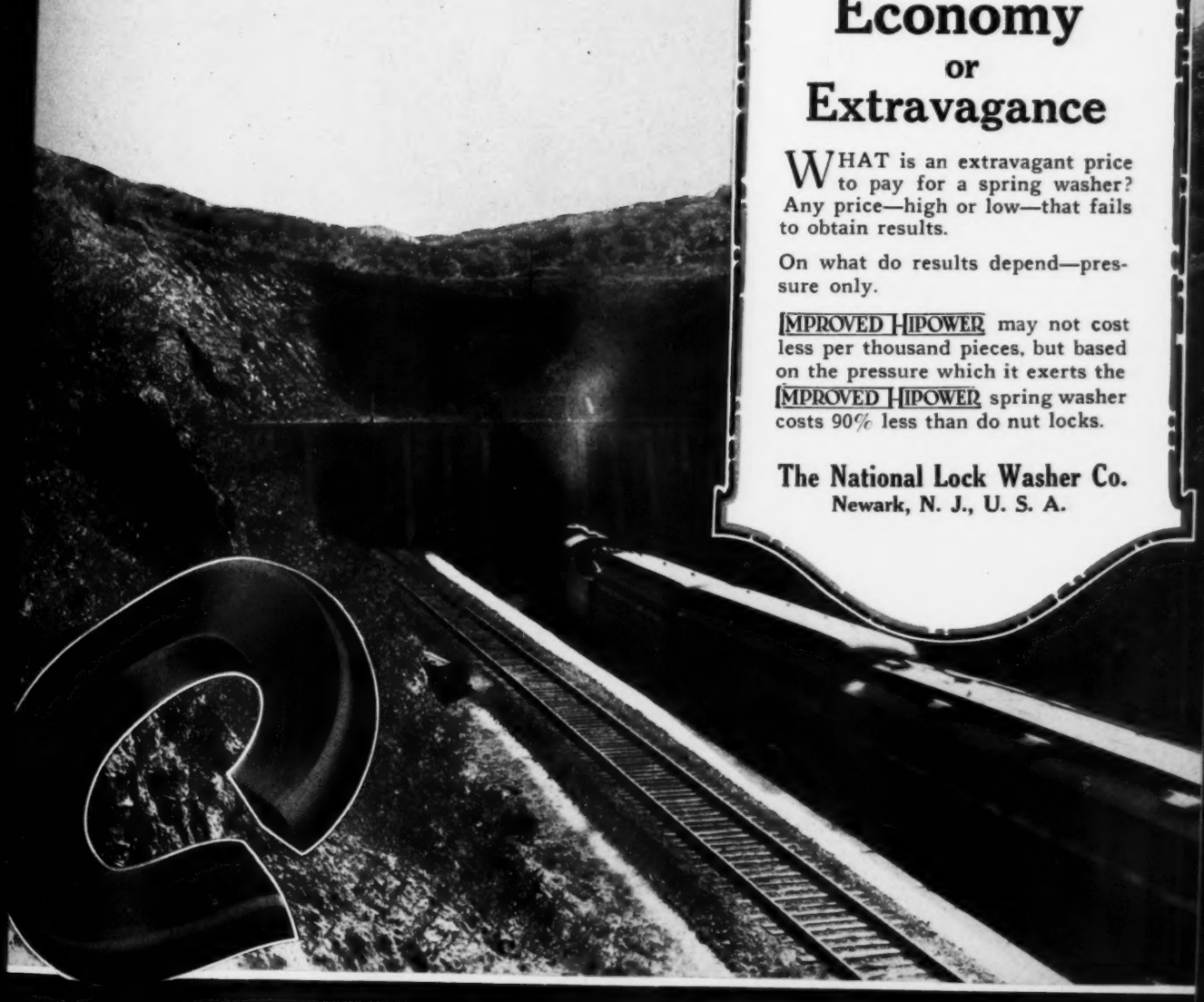
Economy or Extravagance

WHAT is an extravagant price to pay for a spring washer? Any price—high or low—that fails to obtain results.

On what do results depend—pressure only.

IMPROVED HIPOWER may not cost less per thousand pieces, but based on the pressure which it exerts the IMPROVED HIPOWER spring washer costs 90% less than do nut locks.

The National Lock Washer Co.
Newark, N. J., U. S. A.

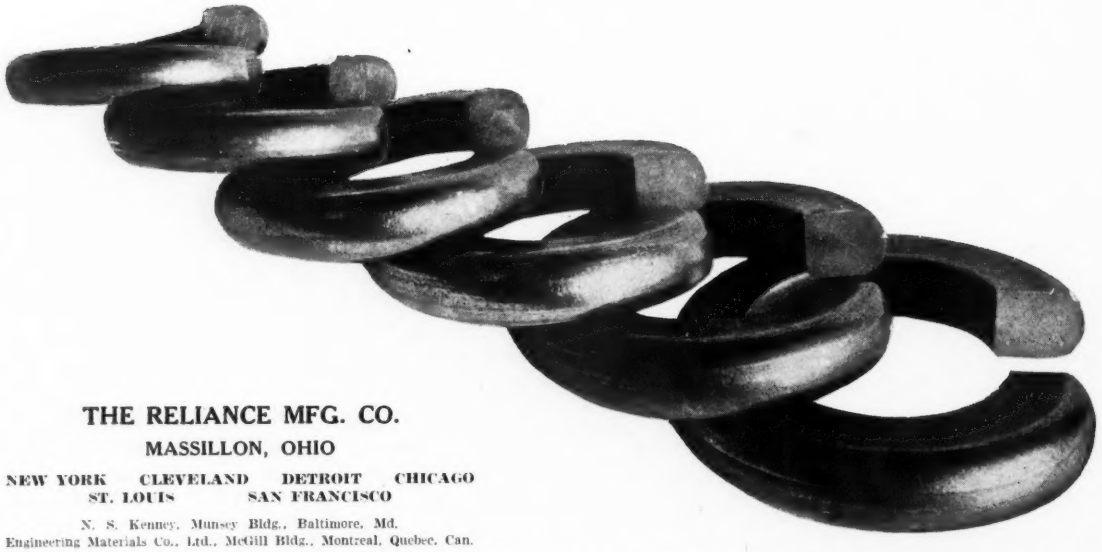


HIPOWER

keeps rail joints tight

THE permanently tight rail joint requires no attention while its maintenance is extremely low. This more satisfactory and economical condition of rail joint rigidity is consistently found wherever Hy-Crome nut locks are applied. When you decide on Hy-Crome, you stop taking chances.

HY-CROME



THE RELIANCE MFG. CO.
MASSILLON, OHIO

NEW YORK CLEVELAND DETROIT CHICAGO
ST. LOUIS SAN FRANCISCO

N. S. Kenney, Munsey Bldg., Baltimore, Md.
Engineering Materials Co., Ltd., McGill Bldg., Montreal, Quebec, Can.

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 608 S. Dearborn St., Chicago. Subscription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered at Chicago, Ill., as second-class matter.

Alphabetical Index to Advertisers, Page 56 Classified Index to Advertisers, Pages 54-56

LOWER COST PER CAR PER MILE

Where the New World Meets the Old—In India

COLUMBUS discovered America because he wanted a new trade route to India—a tremendous land of untold wealth. Three hundred million humans now live there—people to whom nature has dealt a severe hand. Five months of drenching rain, four months of scorching heat—with only a short liveable season.

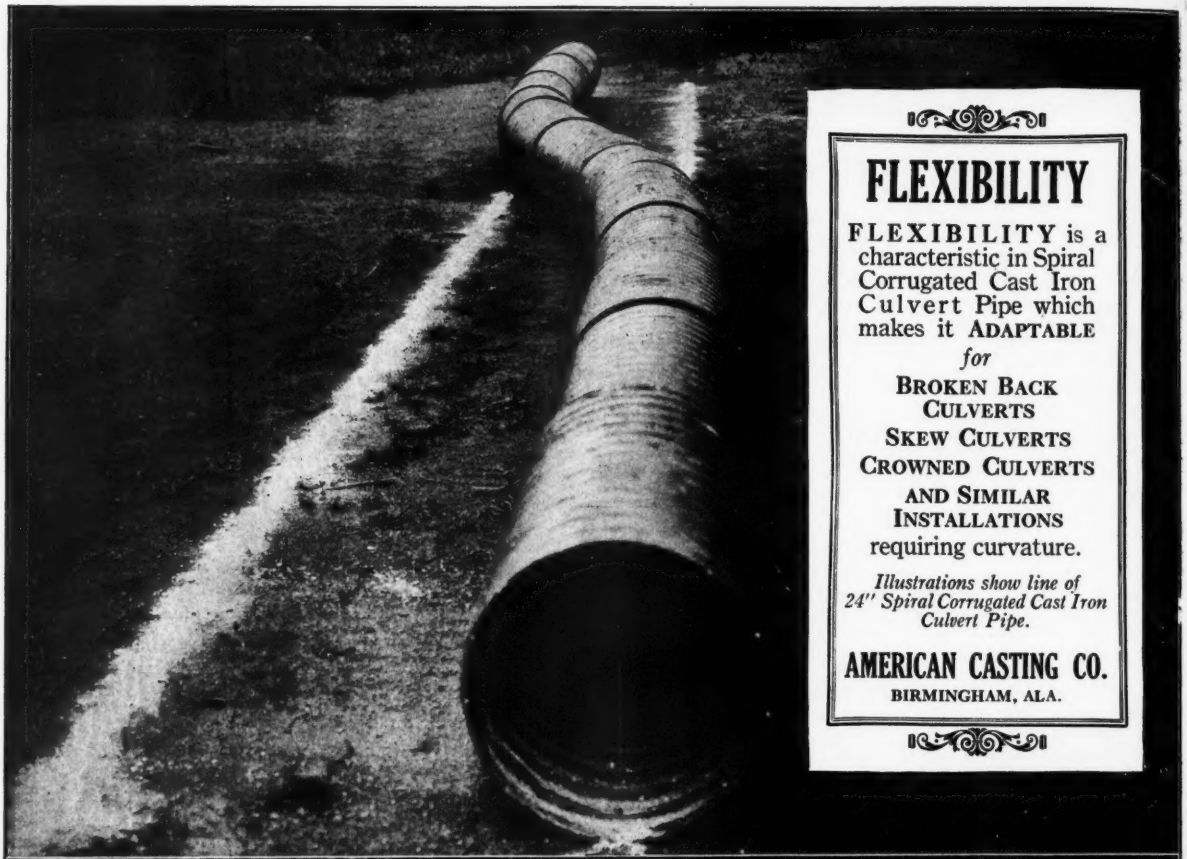
And yet Mudge Motor cars are able to do their work—far from skilled mechanics. They stand up in India—just as they do all over the world—because power and stamina are built right into them.

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Building, Chicago

A MOTOR CAR FOR EVERY SERVICE

REM 4-B-Gray



FLEXIBILITY

FLEXIBILITY is a characteristic in Spiral Corrugated Cast Iron Culvert Pipe which makes it **ADAPTABLE** *for*

BROKEN BACK CULVERTS
SKEW CULVERTS
CROWNED CULVERTS
AND SIMILAR INSTALLATIONS
requiring curvature.

Illustrations show line of 24" Spiral Corrugated Cast Iron Culvert Pipe.

AMERICAN CASTING CO.
BIRMINGHAM, ALA.

The Mark of a Good Derail

When you see the Q & C Trade Mark on a derail you can be assured of sturdy construction and positive derailing service.

They are not only economical in initial cost and maintenance but the adjustable feature makes it possible to carry a minimum in your storehouse.

All models Q & C hand and mechanical derails are interchangeable within their respective types, thus eliminating any confusion in stores requisitions.

Q & C Derails are standard equipment on some of the largest railroads in the country.

Our engineering department will be glad to furnish blue prints and literature on request.

A Derail for Every Requirement

Q & C Mechanical and Hand Derails are furnished in left, right and double throws. We also manufacture Portable Derails, Switch Stands, Target Stands and special connecting rods for derails.

THE Q & C COMPANY, 90 West St., New York

Peoples Gas Bldg., Chicago Railway Exchange Bldg., St. Louis

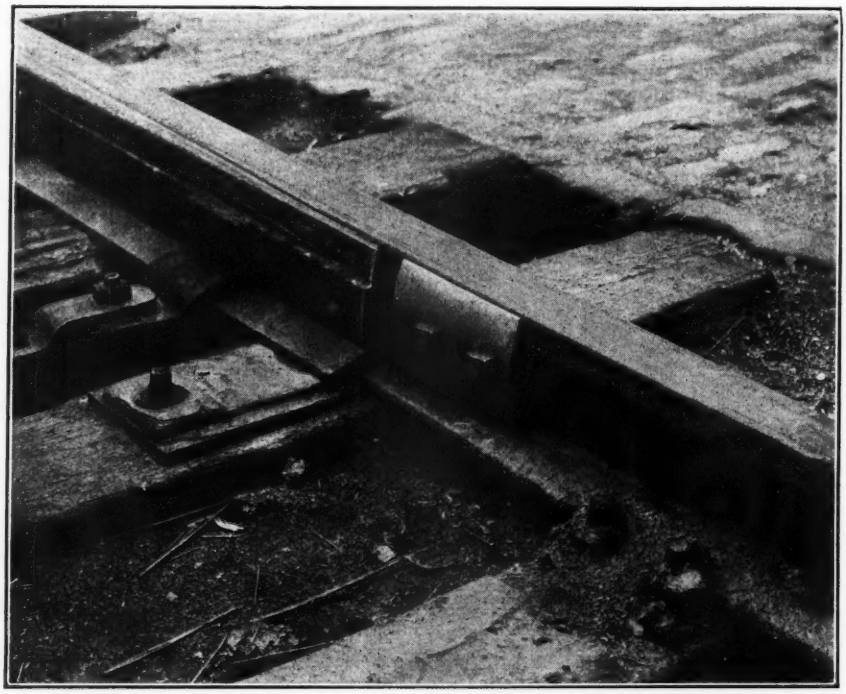
The Reversible "Mack" Switch Point Protector

THIS IS IT!

A NEW and distinct maintenance economy is made not only possible, but entirely practical, in the Reversible "Mack" Switch Point Protector. Mechanically, it is simplicity itself. As shown in the illustration, the "Mack" as now made, gives double the service by means of the simple operation of inverting it after one edge shows sufficient wear to make a new protector advisable.

In other words, the lower edge becomes the top edge and the service life of the protector extended to double the wear without additional cost.

Positively the most economical way to protect the switch point—and add years to its life.



An Economic and Safety Device

LET the Mack Switch Point Protector absorb the wear and increase the life of your switch points.

Mack Switch Point Protectors are simple, inexpensive, and positive in action. For switch points to last ten times longer with this protection is not uncommon in actual service tests.

Installation can be made easily at small cost—replacements are made in a few minutes by one man—their efficiency is not impaired by weather conditions.

"Mack" Switch Protectors are made of manganese steel, for any size rail.

Send us a description of rail used, and we will furnish you a few protectors for test

J. R. FLEMING & SONS, INC.

SCRANTON, PA.

Patented in U. S. and Foreign Countries

Sound Logic

Alloy Steels are being used generally for reciprocating and highly stressed parts of new locomotives, because alloy steels render better service in every way. If better side rods can be made from the proper alloy steels surely better engine bolts and stay bolts which are continually requiring replacement can be made from the proper alloy steels. Interstate metallurgists will welcome an opportunity to go into the matter with you.

INTERSTATE IRON & STEEL CO.
104 South Michigan Avenue
CHICAGO

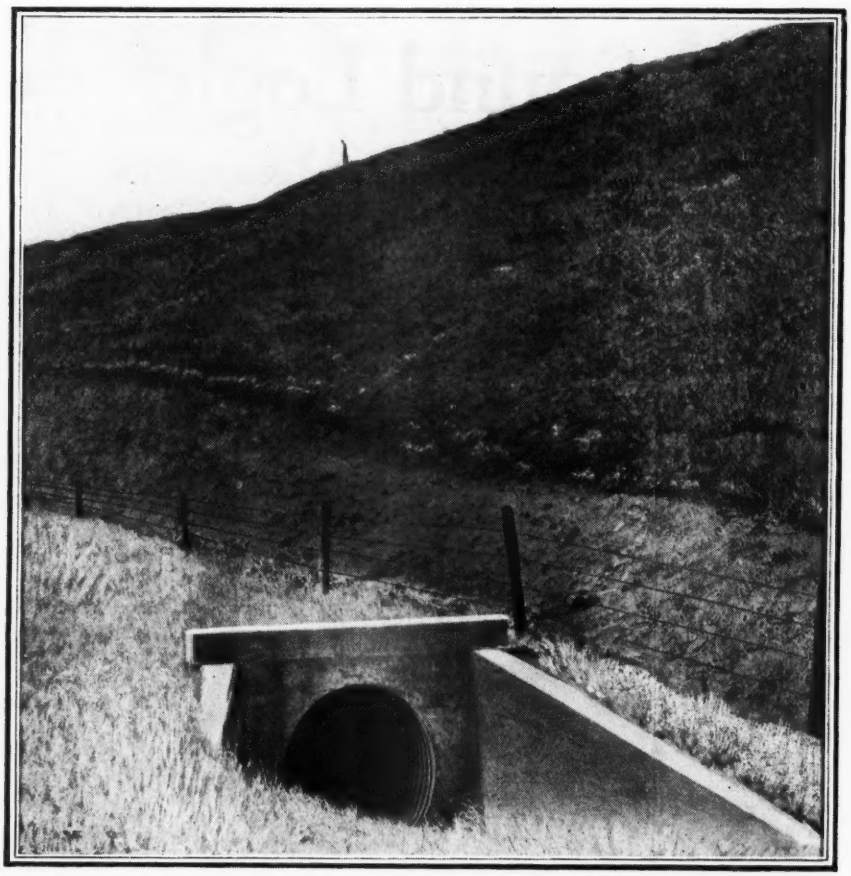
Open Hearth Alloy Steel Ingots, Billets, Bars
Wire Rods, Wire, Nails, Rivets and Cut Tacks
Iron Bars and Railroad Tie Plates

Interstate Steels

District Offices:

NEW YORK—52 Vanderbilt Avenue
DETROIT—Washington Boulevard Building
MILWAUKEE—First Wisconsin National Bank Building
CLEVELAND—Union Trust Building
ST. PAUL—Merchants National Bank Building
ST. LOUIS—International Life Building
SAN FRANCISCO—Monadnock Building
KANSAS CITY—Reliance Building

Equal distribution *of* pressure—*the*



ARMCO Culvert installed in 1913 under 80-foot fill.

What performance has proved th

INVESTIGATION of more than 19,000 culverts in actual service has shown that the performance of ARMCO culverts is not equaled or approached by any other culvert in common use—in strength, in durability, in economy. Heavy fills, impact of traffic, swelling and freezing soils, do not impair the service rendered by ARMCO culverts.

Now the test at Farina, Illinois, conducted by the Roadway Committee of the A. R. E. A. to determine culvert loadings explains the phenomenal performance of ARMCO culverts under all conditions of service. The chart shows that by equalizing their loads, flexible culverts reduce the stresses due to the weight of embankment and traffic.

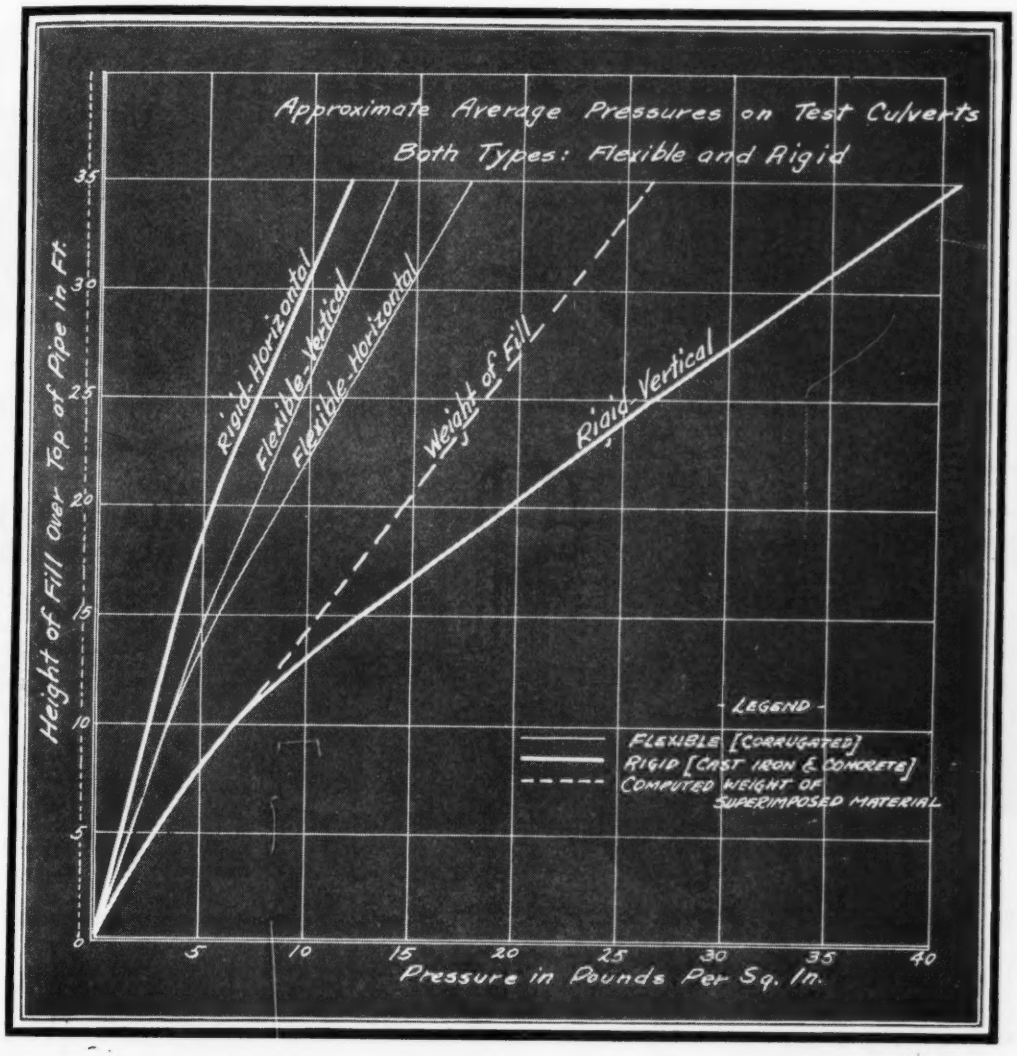
TRADE MARK ARMCO REG. U.S. PAT. OFF.

INGOT IRON

ARMCO

Consistent performance

the key to culvert safety—



the Farina Test *now explains*

Note the vertical and horizontal pressure curves for the flexible type culvert show that the pressure is evenly distributed over the top and sides, while with the rigid type, the load concentrated on the top of the culvert is even greater than the weight of fill.

The test at Farina, Illinois, is of tremendous importance to every engineer responsible for continuity of traffic. If you haven't yet received a copy of the report the coupon will bring it.

Armco Culvert & Flume Mfrs.' Assn.
Middletown, Ohio

CULVERTS

because of consistent uniformity

The Armco Culvert & Flume Mfrs. Association
Middletown, Ohio

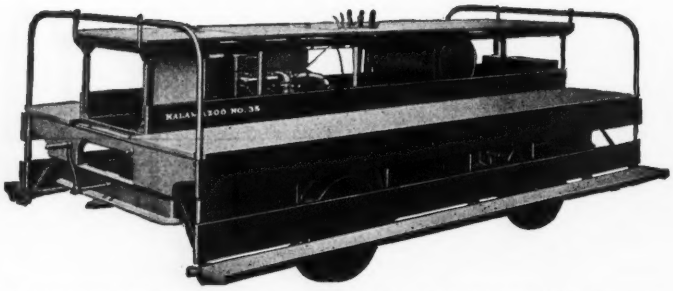
Please send me a complete report of the recent Farina Investigation into culvert load determination.

.....

.....

.....

SAFETY—COMFORT—POWER



Kalamazoo No. 35 Motor Car Standard Body seating thirty persons.

Kalamazoo No. 16-L Motor Car seating one to three pers

The Kalamazoo "25-A" Motor Car with Standard Body seating twelve men.

KALAMAZOO RAILWAY SUPPLY COMPANY

MANUFACTURERS

Kalamazoo, Mich.

Vancouver	Spokane
Winnipeg	Seattle
Montreal	Portland, Ore.
New York	Havana
Chicago	London
St. Louis	Mexico City
New Orleans	Johannesburg
Denver	

Motor Cars —

Trailers —

Hand Cars —

Push Cars —

Rail Cars —

Velocipede Cars —

Rolled Steel Wheels —

"KALAMAZOO" MEANS

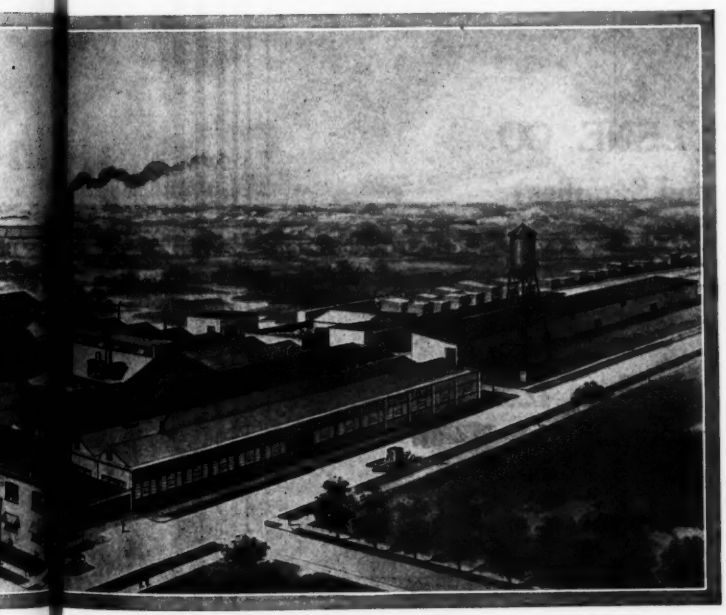
...WER *in these* MOTOR CARS

Kalamazoo No. 16 Motor Car seating one to four persons.

The Kalamazoo No. 35-G Inspection Car seating twelve people

Kalamazoo No. 17 Section Car seating six to eight persons.

Kalamazoo No. 23 Motor Car seating eight to ten persons.



Wood Center Wheels —
Track Drills —
Gauges —
Levels —
Electric Crossing Gates —

...NS SERVICE TO YOU

THE OXWELD RAILROAD SERVICE COMPANY

representing

THE LINDE AIR PRODUCTS CO.
(Linde Oxygen)

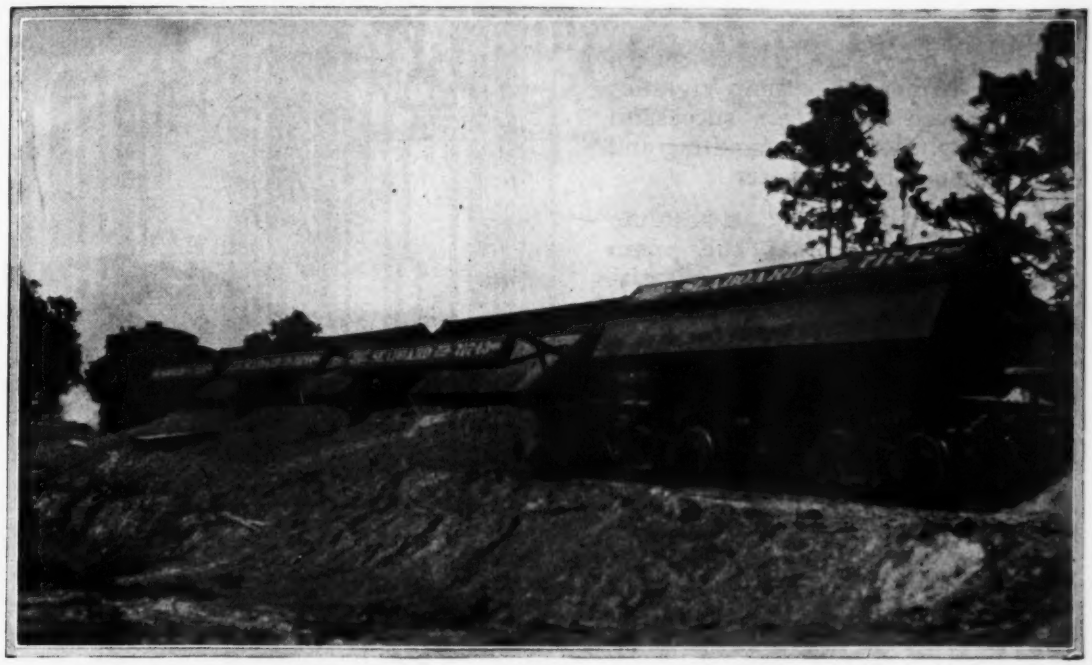
THE PREST-O-LITE CO., Inc.
(Prest-O-Lite Acetylene)

UNION CARBIDE SALES CO.
(Union Carbide)

OXWELD ACETYLENE CO.
(Oxweld Apparatus and Supplies)

Railway Exchange
Chicago

30 East 42d Street
New York



Western all-purpose automatic air dump cars used by the Seaboard Railroad in its Florida work

All-Purpose Air Dump Cars

RAILROAD engineers long have recognized the economy of ditching and doing betterment work with Western air dump cars equipped with aprons for railroad use. They pay for themselves in time and money saved. Railroads now are finding other uses for these all-purpose air dump cars.

Western

That's Why

When the recent New England blizzard buried the railroads Western air dump cars hauled away the snow.

They handle economically the accumulations of locomotive cinders at railroad terminals.

Railroads use them for hauling away waste material from industrial plants in their territory.

They are invaluable in cold storage.

Here is a point worth considering. The big Western 30-yard car is so designed that it can be built up to a level full capacity of 45 and even 50 cubic yards for handling light material. They rob cinder disposal in winter of its terror. Make work easier for the men and cheaper for the company.

Western cars are automatic air dump cars dumping to either side instantly and have all the strength and dependability that make Western dump cars sought after by nine-tenths of the contractors engaged in railroad construction.

May we send a representative to explain in detail the advantages of these Western all-purpose dump cars for railroad use. Write today.

We sometimes have cars available for rent to railroad departments who desire to avoid an increase of capital account. If interested write for information.

Western Wheeled Scraper Company

Founded 1877

Earth and Stone Handling Equipment

AURORA, ILLINOIS

The name-plate on an "American" pump signifies over fifty years successful solution of the handling and pumping of water.

It is backed by an absolute guarantee that the pump bearing it will give satisfactory service on the job for which it is designed!

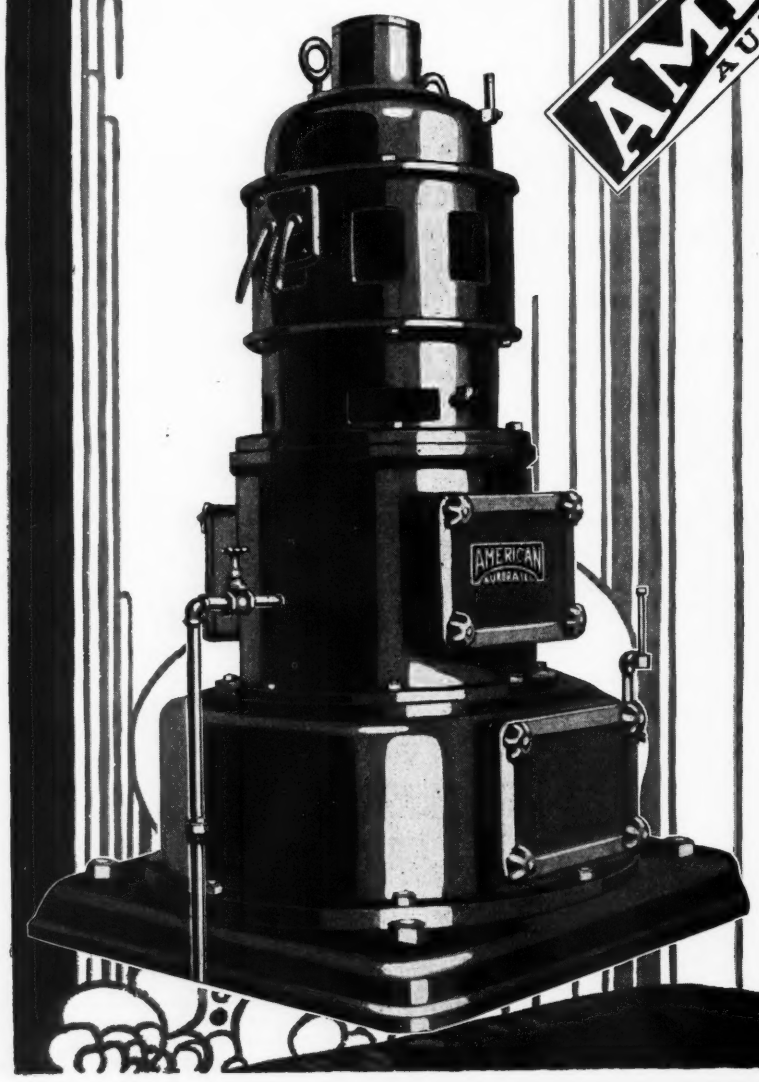
THE AMERICAN WELL WORKS

General Office and Works: Aurora, Illinois

Branch Offices:

Chicago, Ill. ..... First National Bank Bldg.
Milwaukee, Wisc. ..... Wisconsin National Bank Bldg.
New York, N. Y. ..... 165 Broadway
Dallas, Texas ..... Western Indemnity Bldg.
San Francisco, Calif. ..... 635 Mission St.

AMERICAN
AURORA, ILL.



District Sales Agencies:

Philadelphia, Pa
Pittsburgh, Pa.
Cleveland, Ohio
Detroit, Mich.
St. Paul, Minn.
Omaha, Nebr.
St. Louis, Mo.
Kansas City, Mo.
Joplin, Mo.
Atlanta, Ga.
Birmingham, Ala.
Jacksonville, Fla.
New Orleans, La.
Roswell, N. Mex.
Denver, Colo.
Salt Lake City, Utah
Phoenix, Ariz.
Los Angeles, Calif.
Charlotte, N. C.
Clagary, Alta. Can.
Boston, Mass.

RACOR

SEVEN WORKS
RAMAPO-AJAX-ELLIOT
HILLBURN, NEW YORK
NIAGARA FALLS, N.Y.
CHICAGO, ILLINOIS
EAST ST. LOUIS, ILL.
PUEBLO, COLORADO
SUPERIOR, WISCONSIN
NIAGARA FALLS, CANADA

HEAVY DUTY HEAT TREATED GUARD RAIL CLAMPS
DROP FORGED RAIL BRACES
ADJUSTABLE RAIL BRACES
EUREKA ADJUSTABLE CLIPS
MANGANESE REINFORCED SWITCH POINTS
RAMAPO AUTOMATIC SAFETY SWITCH STANDS
AJAX MANGANESE ONE-PIECE GUARD RAILS
SWITCHES – FROGS
CROSSINGS – SPECIAL
RAILWAY TRACK WORK

RACOR
Heat Treated Heavy
Duty Guard Rail Clamp

RAMAPO
Safety Switch Stand
Style No. 17

RACOR
Adjustable
Rail Brace

RACOR
Drop Forged
Rail Brace

RAMAPO
Safety Switch Stand
Style No. 20-B

AJAX MANGANESE
One-Piece
Guard Rail

EUREKA ADJUSTABLE
Open Side Switch Clip

RACOR
TRADE MARK
REGISTERED

Main Office – HILLBURN, NEW YORK
SALES OFFICES AT WORKS, ALSO
30 CHURCH STREET, NEW YORK
McCORMICK BUILDING, CHICAGO

RAMAPO AJAX CORPORATION

THE ANDERSON Switch INTERLOCKER

Makes the Switch ABSOLUTELY SAFE

Accidents occurring from the following causes are prevented by the ANDERSON Switch INTERLOCKER:

. . . switch stand being knocked down and destroyed by an automobile, hit and carried on the pilot of the locomotive, a shifting load of pipe or poles, or a mail bag thrown from the train.

. . . switch opening under traffic because of connection damaged by something hanging from the train, throwing lever working out of its socket or worn or broken parts.

. . . switch stand improperly padlocked due to switch being disengaged from stand or an obstruction leaving a gap between the point and rail.

With the ANDERSON Switch INTERLOCKER, the switch is held safe for traffic, and INTERLOCKED regardless of damage to the switch stand or connections. The switch stand cannot be padlocked unless the switch is properly closed and INTERLOCKED.

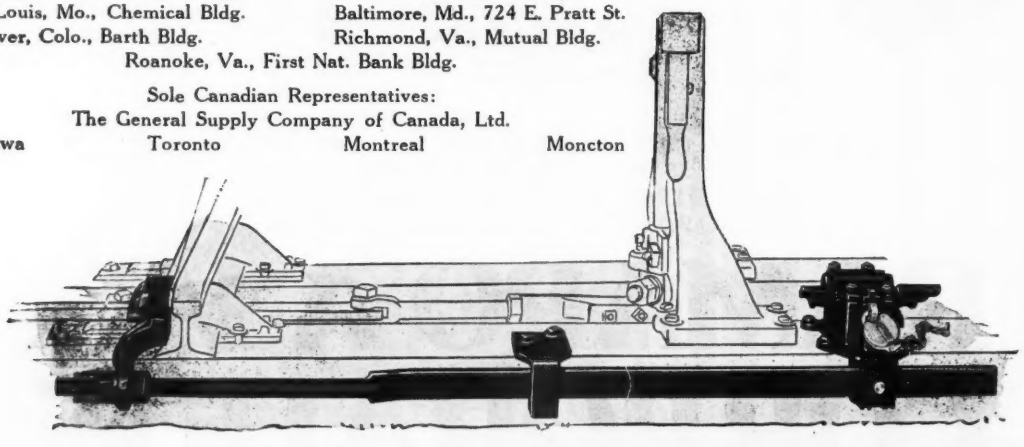
These points and others are more fully described in BULLETIN 101, which we will send you on request.

The American Valve & Meter Co., Cincinnati, Ohio, U. S. A.

Branch Offices:

Chicago, Ill., McCormick Bldg. Boston, Mass., Essex Bldg.
St. Louis, Mo., Chemical Bldg. Baltimore, Md., 724 E. Pratt St.
Denver, Colo., Barth Bldg. Richmond, Va., Mutual Bldg.
Roanoke, Va., First Nat. Bank Bldg.

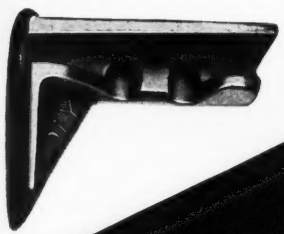
Sole Canadian Representatives:
The General Supply Company of Canada, Ltd.
Ottawa Toronto Montreal Moncton



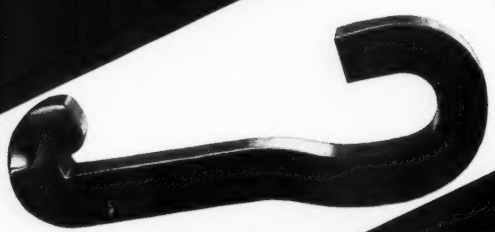
The Daily Dozen of Verona Rail Joint Springs

1. They make bolts tight and keep them tight
2. They assure uniform bolt tightness
3. They permit the use of finger fit bolts
4. They permit uniform rail expansion
5. They couple bolts in pairs and thus assure "team work"
6. They save wear of joints
7. They save battering of rail ends
8. They cut bolt-tightening costs
9. They shorten the line at the pay car
10. They save bolts
11. They save ties
12. They save wrenching

This is the broad, rugged shoe of the Ericson Rail Anchor. Note that it is made of malleable iron.



This is the big, adjustable, nonbreakable yoke of the Ericson Rail Anchor. Note that it is made of heat treated steel.



When it is driven to place, this steel yoke bites into the softer malleable shoe so that in effect the anchor becomes practically a single piece of metal and part of the rail itself.

VERONA TOOL WORKS

Pittsburgh, New York, Chicago, Boston, St. Louis
San Francisco, New Orleans, Washington, St. Paul
Denver, Baltimore, Louisville

The New Sheffield 45 is-- *of course*-- Hyatt Equipped

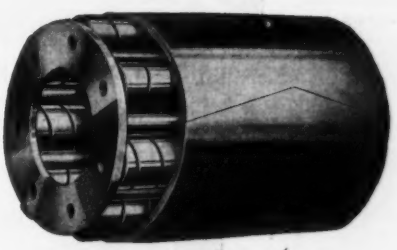
HYATT Roller Bearings have been standard journal box equipment on Fairbanks Morse cars for many years.

Their selection for the new Sheffield No. 45—though anticipated—was first justified by exhaustive tests.

Unique features of this modern car are the free running, air-cooled engine with simplified variable speed drive of improved friction disk type—a light pressed steel automobile type frame—and flywheel magneto.

This equipment, like the Hyatt journal bearings, was adopted to promote economy and freedom from trouble in hard service.

HYATT ROLLER BEARING COMPANY
NEWARK DETROIT CHICAGO SAN FRANCISCO
WORCESTER PHILADELPHIA CHARLOTTE
PITTSBURGH CLEVELAND



Prominent builders of maintenance cars furnish Hyatt Roller Bearings because they have proved—in nearly two decades of railway usage—that they cut gasoline, oil and other expense, and operate faultlessly months at a time without attention of any sort.

HYATT
ROLLER BEARINGS

HACKMANN COMBINATION TRACK LINER

Two Step Base
Weight 20 lb.

BEST BY TEST

SAVES 60% OF YOUR LABOR AND TOOL COST

now in use on over

100 RAILROADS

Combination
Tamping Bar

Combination
Lining Bar

Seven Men Lining Switch with the Hackmann Combination Track Liner

HACKMANN TRACK LINERS CAN BE USED AT END OF TIES WITHOUT DISTURBING THE LOOSE RAIL OF THE SWITCH

Weight 32 lb.

CONSERVE MAN POWER

THE IDOL TRACK LINER

Can Be Used With Ordinary
Lining Bars

Write for Our Book of Instructions

We Will Gladly Demonstrate

THE HACKMANN RAILWAY SUPPLY CO.

RAILWAY SAVING DEVICES—723 So. Wells St., CHICAGO, ILL.

FREDERICK HACKMANN,
President and Mechanical Engineer
J. J. FRANZEN,
Secretary and Treasurer

LAUGHLIN & CHENEY
Chicago, Ill.
W. D. ACHUFF
St. Louis

BALDWIN LOCOMOTIVE WORKS
Foreign Representatives
WM. ZEIGLER CO.
Minneapolis, Minn.

THE HOLDEN CO. Ltd., Canada
Toronto Montreal Winnipeg
Vancouver

A Mouthful at Every Bite

Guarantee
Owen Buckets, properly installed and operated, are guaranteed to do a bigger day's work than any other bucket of the same weight and capacity—
—or—
Write your own guarantee!
OWEN BUCKET CO.

There's balance in an Owen Bucket. It won't tip over, and it won't scrape over the material, either —but digs down deep when loading. Doesn't this mean a saving of time and money to you?

A correct distribution of weight throughout the Owen construction is obtained by a counterweight feature which gives balance and digging ability. The counterweight holds the closing sheaves and cable high out of the material, thus reducing sheave and cable wear to a very minimum and giving maximum digging power.

Years of continuous service under the most severe working conditions have proven the Owen as a well-balanced digging bucket—and like the hippo of great strength, it gets A Mouthful At Every Bite.

There are nine distinctive points in the story of Owen Bucket superiority. Want them? Write us.

The OWEN BUCKET Co.

405 Rockefeller Building Cleveland, Ohio

Baltimore Chicago Dallas Detroit Los Angeles Minneapolis
Philadelphia Pittsburgh New York Miami Portland
St. Louis San Francisco Tampa

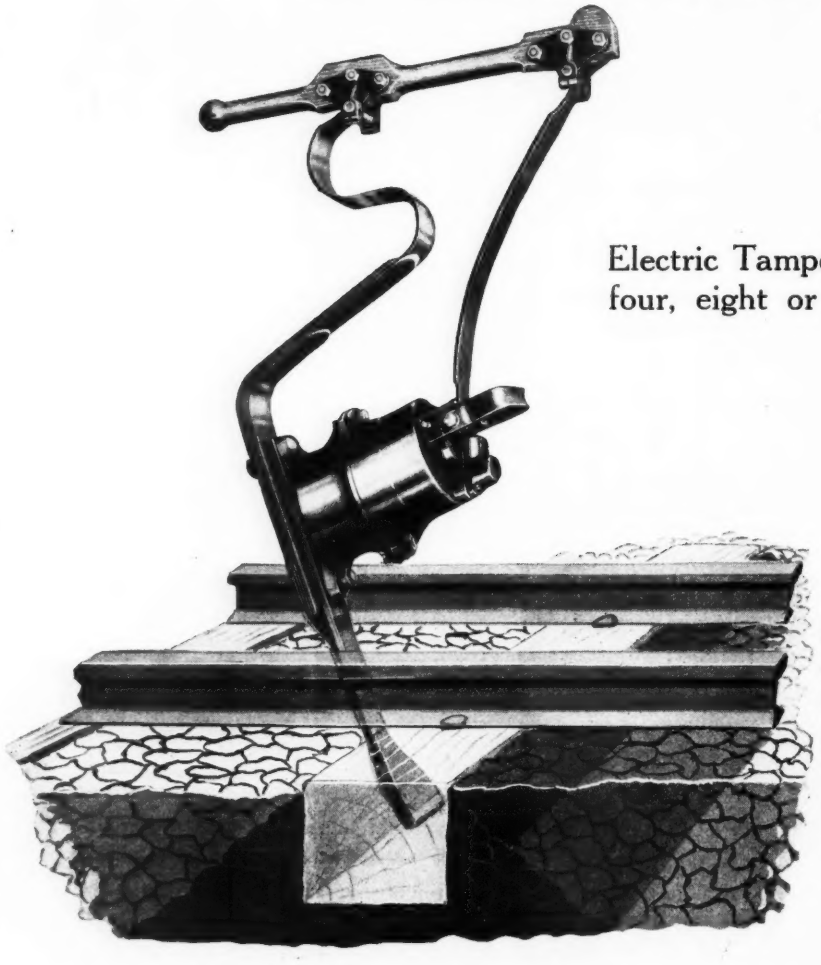
Owen Buckets

INSURE A BIGGER DAY'S WORK

C O. B. CO.

ELECTRIC TAMPING

Has Proven a Most Successful Method of Tamping Rock, Gravel, Chats, Cinders or Other Light Ballast



Electric Tampers are made up in four, eight or twelve tool units.

Please send for our catalogue TT-6 and our instruction book covering mechanical tie tamping methods.

TAMPING GRAVEL BALLAST

On account of the numerous vibratory blows delivered by the electric tamper (4000 per minute) a settling process of the ballast takes place which eliminates voids such as left between the pieces of larger ballast when hammered in with a direct blow.

This results in a uniformly compact mass of ballast along the entire underside of the tie, packed to a depth of 12 to 15 inches. Consequently traffic will not settle electrically tamped track.

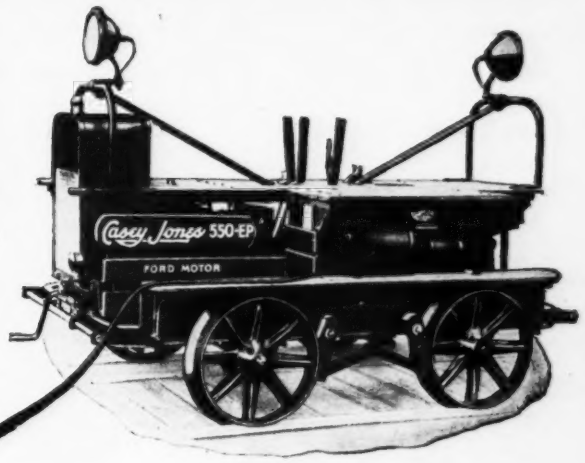
ELECTRIC TAMPER & EQUIPMENT CO.

RAILWAY EXCHANGE CHICAGO, ILLINOIS

GAS-ELECTRIC POWER CAR

Casey Jones 550-EP

A COMPLETE POWER PLANT
FOR ELECTRIC TRACK TOOLS



Standard Ford Motor

EQUIPPED WITH GOVERNOR AND WATER CIRCULATING PUMP

7½ K.W. UNIVERSAL GENERATOR

Supplies either direct or alternating current at 110 volts and will operate any standard electric motor driven appliance within its capacity, 7½ K.W.

Tamping track—will operate 12 Jackson Electric Tie Tampers for extra gang use.

Bridge construction and repair—will operate tools for drilling either steel or wood, scoring ties, grinding and tool dressing, rail and timber saws.

Rail cutting in or out of track—will operate a battery of ten Racine Rail Saws for cutting off battered rail ends.

Rail drilling—will operate electric rail drills of 1½-inch capacity, also bonding drills for signal service.

Changing angle bars—will operate nut wrenches for removing or tightening angle bar nuts.

Flood lighting—will operate flood lights for emergency jobs as washouts, wrecks, etc.

Motor car—will transport with trailers up to 70 men or an equivalent load of materials to and from the job. Requires no special foundation but can be set off by four men on a standard motor car set-off.

REGIONAL BRANCH OFFICES

WASHINGTON, D.C.	W. NEWTON JEFFRESS, INC. EASTERN EXECUTIVE 1319 F STREET N. W.
NEW YORK	SHAFFNER & ALLEN 50 CHURCH STREET
CHICAGO	OTIS B. DUNCAN 53 W. JACKSON BOULEVARD
BIRMINGHAM	A. A. CULP 239 BROWN-MARX BLDG.
ST. LOUIS	WM. J. ROEHL RAILWAY EXCHANGE
ST. PAUL	RANK & GOODELL 906 MERCHANTS BANK BLDG.
SAN FRANCISCO	W. H. WORDEN CO. 126 PINE STREET
PORTLAND	WESTERN RAILWAY SUPPLY CO. 15th & JOHNSON STS.
FOREIGN	Koppel Industrial Car & Equip. Co. KOPPEL PA. EXCLUSIVE-EXPORT AGENTS

NORTHWESTERN MOTOR COMPANY

FACTORY and GENERAL OFFICE — EAU CLAIRE, WIS., U. S. A.

Casey Jones REG. U.S. PAT. OFF.

MANUFACTURERS—RAILWAY MOTOR CARS

The Far Flung Water Lines

RAILWAY water supply runs the whole scale of water engineering. It must be maintained under all sorts of conditions, from those of the railroad yard in crowded cities to the country cross roads where the station and the water tower compose the "town."

Water supply must be maintained for many purposes; for engines, for fire protection, for passengers, for the watering of stock in transit, etc.

But under all these varied circumstances there are two conditions that must always be reckoned on by the railway water engineer. First, the supply of water must be dependable, and tied up with this, the water line must be free from repairs.

For these reasons, many railroads are standardizing on Cast Iron Pipe. Whether the line be under the intricate track system of the railroad yard, where repair represents a serious interruption to train handling, or in some out of the way hamlet, where a repair crew must be sent many miles, these engineers are standardizing on Cast Iron Pipe.

For the test of centuries has proven, that nothing lasts like Cast Iron Pipe.

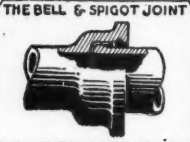
It eliminates the common source of pipe line failures—corrosion.

On this page are shown several installations of Bell & Spigot Cast Iron Pipe on railroad supply lines. This bureau will gladly furnish information on this or any other phase of the use of Cast Iron Pipe.

Address: RESEARCH ENGINEER
CAST IRON PIPE PUBLICITY BUREAU, PEOPLES GAS BUILDING, CHICAGO

CAST IRON PIPE

THE BELL & SPIGOT JOINT

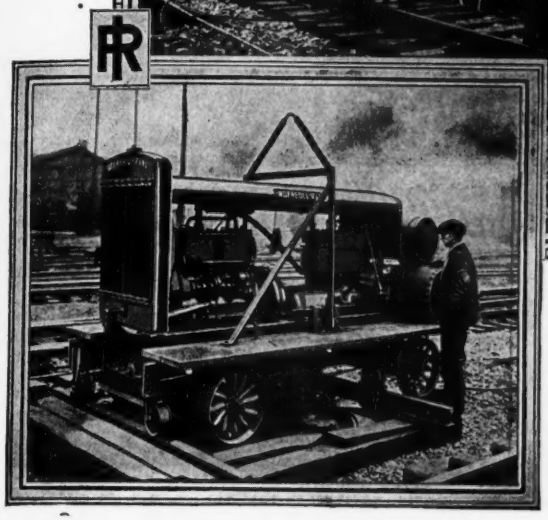


THE ACCEPTED STANDARD FOR UNDERGROUND CONSTRUCTION

Our new booklet, "Planning a Waterworks System," which covers the problem of water for the small town, will be sent on request

Send for booklet, "Cast Iron Pipe for Industrial Service," showing interesting installations to meet special problems

Twelve pneumatic tie tampers operated from a tie tamper air compressor.



Some of the air tools operated from a tie tamper compressor.

Labor-Aiding Compressed Air Tools

A pneumatic tie tamping outfit and air tools make it possible to save labor and speed up the work on dozens of operations.

The pneumatic tampers enable each man to tamp three to four times as much track per day as by hand methods. Not only is the work done better but large savings in labor are effected in the labor costs.

Other air tools, such as sand blast and paint sprays, grinders, pneumatic wrenches, rail bonding drills, rail drills, riveting hammers, etc., can be used with tie tamper compressors. These devices mean further increases in the labor savings. Ask for complete information.

Pneumatic Tie Tamper.

Portable Pneumatic Grinder.

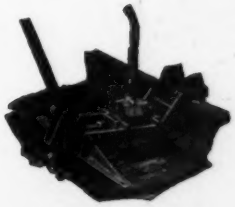
Sand Blaster Paint Spray.

INGERSOLL-RAND COMPANY

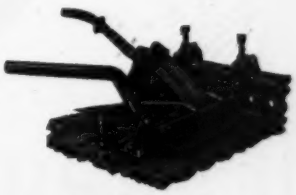
11 Broadway **New York City**

Offices in principal cities the world over.
For Canada Refer—Canadian Ingersoll-Rand Co., Limited,
260 St. James Street, Montreal, Quebec

Pneumatic Wrench.



Rail Bonding Drill.
Drills up to 9/16" die.



No. 9 Rail Drill.
Drills 9/16" and larger.

Ingersoll-Rand

LUNDIE TIE PLATE

Prevents cutting of a single fibre of the tie

TIE protection against mechanical wear depends entirely upon the type of tie plate used.

Money spent on costly treated ties is lost when the cutting ribs of ordinary tie plates eventually break down the wood fibers allowing moisture to go below the safety line of penetration. Premature decay then prevents the treated tie from delivering its full return on the investment.

By scientific design the Lundie Tie Plate develops beneath the plate a hardened wear-resisting surface that assures absolute tie protection under the heavest traffic conditions.

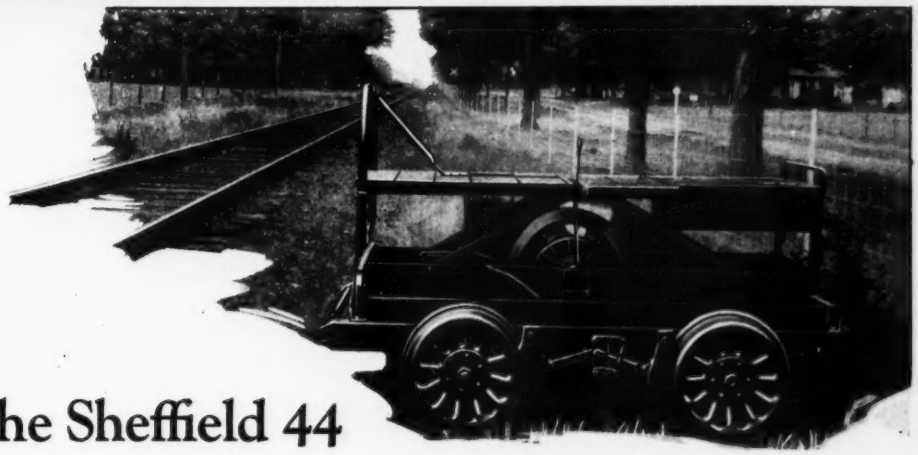
It is this tie conservation and fewer replacements that bring to railroads substantial savings in maintenance cost. This sound basis of ultimate economy each year is influencing more roads in their choice of the Lundie Tie Plate.

The Lundie Engineering Corporation
285 Madison Avenue, New York
166 West Jackson Boulevard, Chicago

LUNDIE DUPLEX RAIL ANCHOR

Tie Plates That Protect

Note remarkable surface protection on illustrated tie after 8½ years under the heaviest traffic conditions.



The Sheffield 44

Perfected clutch transmission with chain drive—the biggest advance in section motor car construction—explains the tremendous popularity of the Sheffield 44. This simple, powerful section motor car has a clutch that is absolutely fool-proof and practically indestructible. *It can't be burned out.*

Various speeds are obtained and loads easily started by slipping the clutch. No tugging at tension levers. No expensive delays due to broken belts. The "44" is a sturdy car built strong and rugged for long life.

The Sheffield 40-B

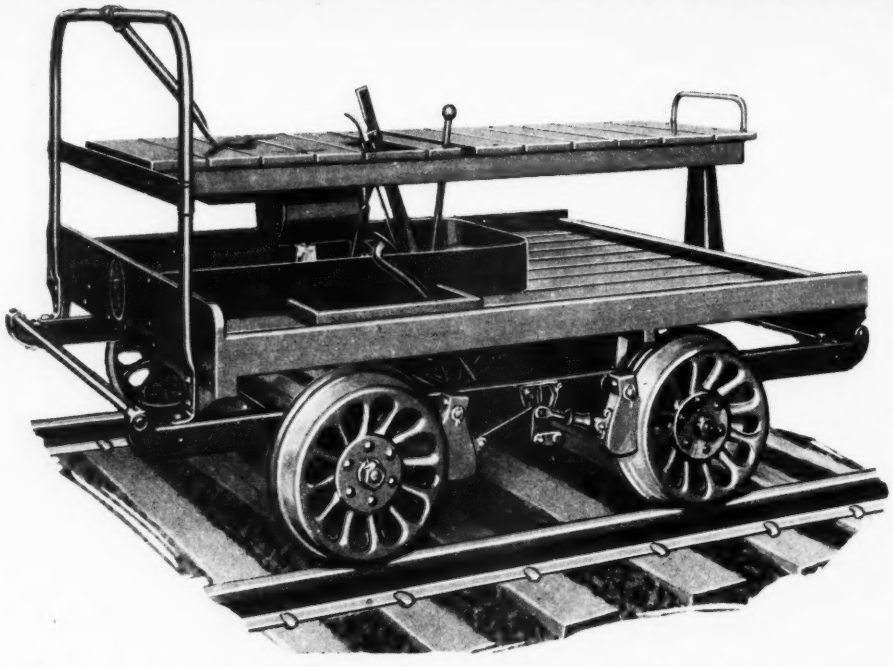
***Super* dependability, economy and performance! The Sheffield 40-B—foremost in everything a fine motor car should be—gives you this, and more. Abundant power. Exceptional torque at low speeds. Three-point suspension of engine. Simplified friction transmission. Timken tapered roller bearings on drop-forged crankshaft and axles prevent wear and absorb thrust. Strong pressed-steel automobile type frame. These and many other features of advanced section motor car design make this a motor car without peer.**

FAIRBANKS, MORSE & CO., Chicago

Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; oil engines; steam, power and centrifugal pumps; scales; complete coaling stations

FAIRBANKS-MORSE
MOTOR CARS

First on the rails —and still first



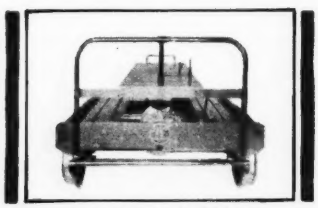
Going strong!—the new Sheffield 45

Inherent ruggedness—a quality that has brought the Fairbanks-Morse line of Sheffield Motor Cars to a foremost position and held them there for 30 years—is also a chief factor in the wide preference, won almost overnight, for the new Sheffield 45 in the light section motor car field.

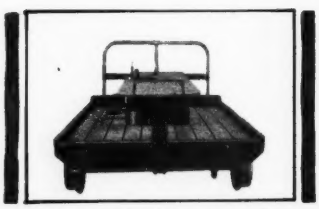
Lighter and less highly powered than the Sheffield 40-B (described on the next page) but more than equal to all ordinary section service, the "45" brings to section motor car construction outstanding features of the best automotive engineering practice, including:

—Two-cylinder opposed air-cooled, four-cycle engine with patented Ricardo cylinder head, widely known and adopted in other fields. This head, which is made removable in the Sheffield 45, gives more power.

—Three-point suspension.



Front view of Sheffield 45



Rear view showing exceptionally large deck space. Note single support which permits greater accessibility of tools

—Ignition from highly developed flywheel magneto, giving a hot spark at slow cranking speeds and insuring easy starting.

—Drop-forged crankshaft mounted on Timken Tapered Roller Bearings which absorb all thrust and radial loads.

—A new and greatly simplified design of friction transmission. Counter shaft mounted on S. K. F. self-aligning ball bearings.

—Pressed steel auto type frame which insures lightness without sacrificing strength.

—Largest deck space ever provided on a section motor car—22 square feet of unobstructed tool space.

—Body readily lifted off by simply removing four bolts.

These and other advanced features make this car a notable addition to the Fairbanks-Morse line of section motor cars. Other Sheffield models are described on the following page.

FAIRBANKS-MORSE
MOTOR CARS

First on the rails —and still first

A-965

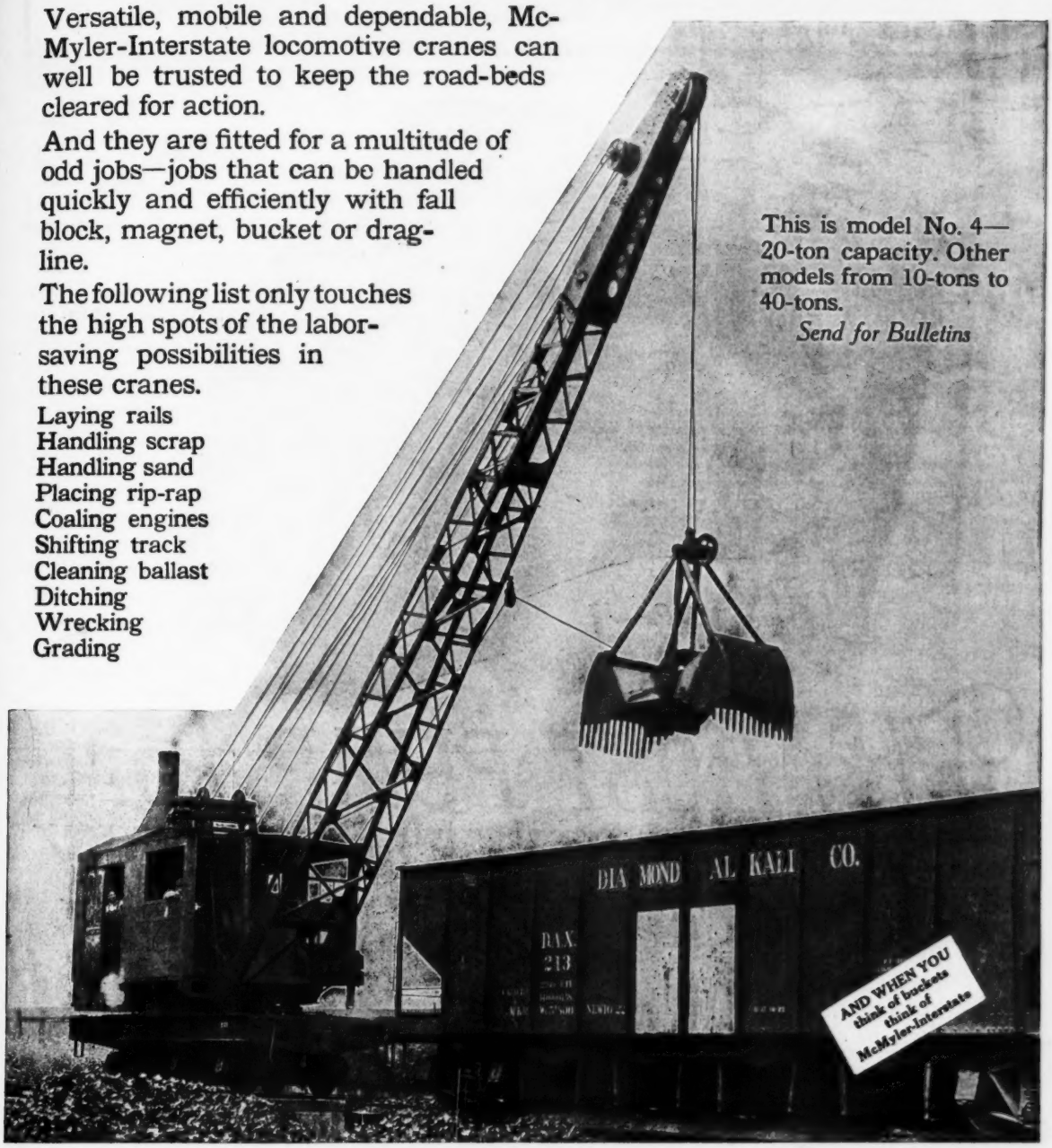
Policing the Right of Way

Versatile, mobile and dependable, McMyler-Interstate locomotive cranes can well be trusted to keep the road-beds cleared for action.

And they are fitted for a multitude of odd jobs—jobs that can be handled quickly and efficiently with fall block, magnet, bucket or drag-line.

The following list only touches the high spots of the labor-saving possibilities in these cranes.

Laying rails
Handling scrap
Handling sand
Placing rip-rap
Coaling engines
Shifting track
Cleaning ballast
Ditching
Wrecking
Grading



This is model No. 4—20-ton capacity. Other models from 10-tons to 40-tons.

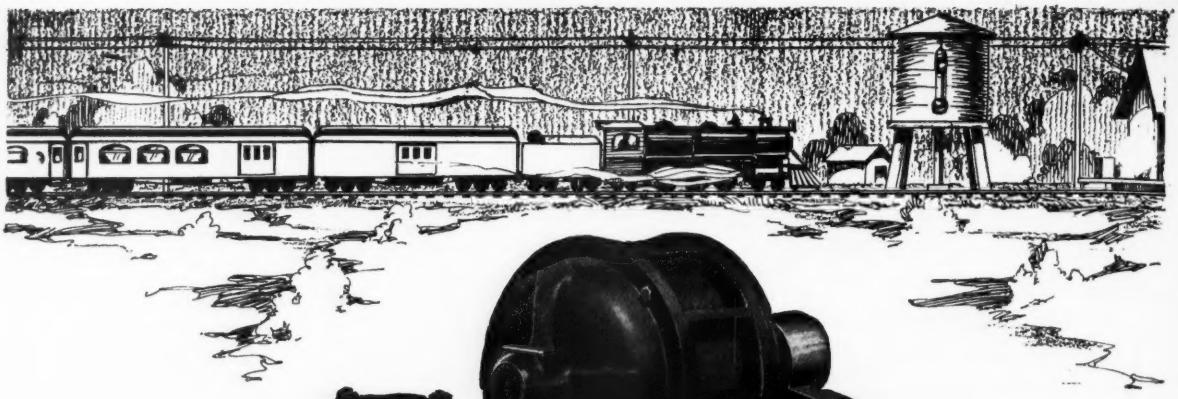
Send for Bulletins

Locomotive Cranes · Clam-shell Buckets · Coal and Ore Handling Machinery

C-4-16

McMyler-Interstate

NEW YORK BUFFALO PHILADELPHIA PITTSBURGH **CLEVELAND** DETROIT LOS ANGELES CHICAGO SAN FRANCISCO



Patent Applied For

Oil Once—a Month!

The BEST PUMP for RAILWAY WATER SUPPLY

Self-lubricated from a single oil reservoir, like an automobile motor—this GARDNER Pump requires attention only once each month. It can be forgotten 29 days at a stretch, and operated by an electric switch, from any distance desired.

Its automatic action insures perfect lubrication at all times, and this means few replacements and long life. Ask for Bulletin EP-1.

"Quality Builders for More Than 65 Years"

THE GARDNER GOVERNOR COMPANY

Quincy, Illinois

CHICAGO 549 Washington Blvd.
NEW YORK 534 Singer Bldg.
PHILADELPHIA 604 Arch St.
HOUSTON 1242 Heights Blvd.
SAN FRANCISCO 401 Rialto Bldg.
LOS ANGELES 2122 E. 7th St. 6811 S. Alameda St.
LONDON 25, Bishopsgate, E. C. 2

GARDNER GOVERNORS PUMPS · COMPRESSORS

GARDNER

CAL

by giving "quick strength" concrete permits quick stripping of forms for re-use on the same job.

1500 LB. concrete in 3 days from a workable 1:2:4 mix clearly demonstrates the tremendous economic value of using Cal. This is the strength obtained in recent tests by American Bureau of Inspection and Tests, Chicago. The same concrete tested 880 lbs. in 24 hours and 1200 lbs. in 48 hours. Using a 1:1½:3 mix and Cal the same tests showed 2200 lb. strength in 3 days.

Forms for practically any type of structure can be stripped within three days from this quality of concrete. Form lumber can be used over again on the same job. There is less material to be handled and stored on the right of way. A quicker and better job throughout.

Cal—a dry white powder put up in bags, can be used with any Portland cement instantly upon arrival at the job without any preparation giving positive assurance of dense lasting concrete.

CAL accelerates the set and the strength of concrete, first by a chemical action and second by increasing its workability through fattening so that much drier consistencies may be used than are ordinarily possible.

NORTH AMERICAN CEMENT CORPORATION

Successor to Security Cement and Lime Company

HAGERSTOWN, MD.

WASHINGTON BALTIMORE ALBANY

LEST WE FORGET

ADVERTISING

Can Only Spread

The FAME Of The NAME

Of A Product

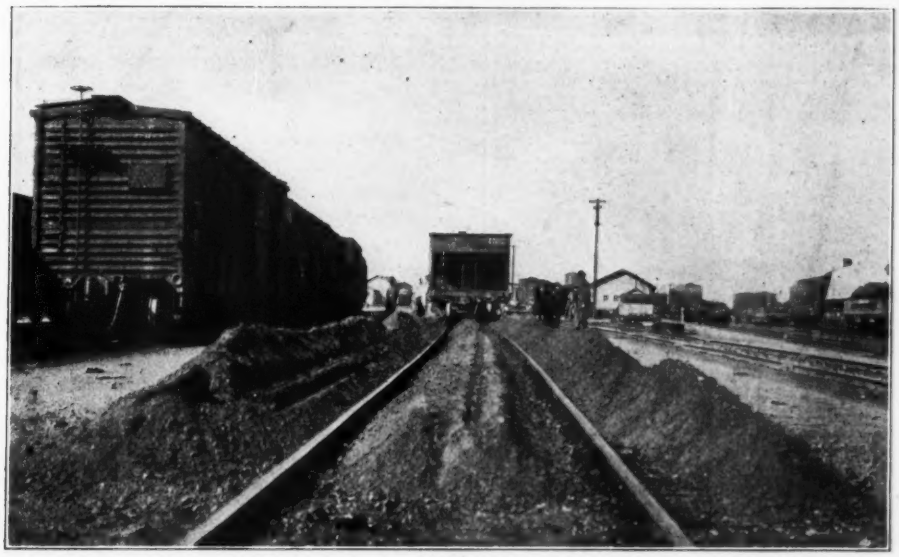
OUR DRESSED UP PRODUCTS
ARE MOSTLY REMINDERS
OF MANY YEARS OF MOST
EXACTING FULFILMENT
OF REQUIREMENTS AND
CONSTANT ATTAINMENT
OF IMPROVED QUALITY

The Rail Joint Company 61 Broadway New York City

THE HART SELECTIVE BALLAST CAR

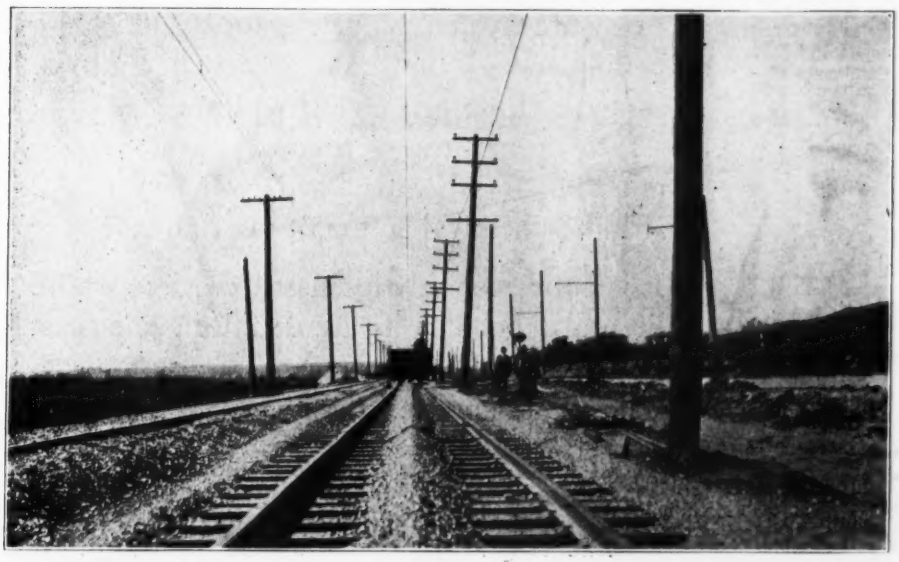
IT CANNOT FLOOD THE RAIL

MAXIMUM



VERY HEAVY DISTRIBUTION TO CENTER AND BOTH SIDES SIMULTANEOUSLY

MINIMUM



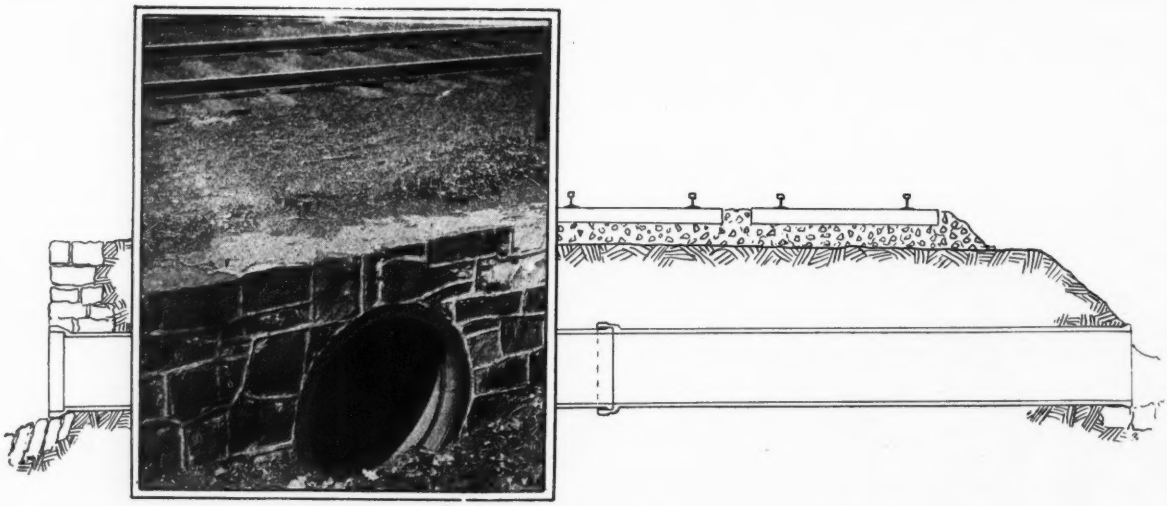
VERY LIGHT DISTRIBUTION TO CENTER AND BOTH SIDES SIMULTANEOUSLY

Places ballast material in the proper quantity just where it is needed, without flooding the rails.

We shall be glad to furnish particulars.

RODGER BALLAST CAR COMPANY

523 Railway Exchange, 80 E. Jackson Blvd.
CHICAGO



Build for permanence with Cast Iron Culverts

A road bed is costly. When you build—you build for permanence.

To insure the permanence of the road bed, the permanence of the drainage system must be assured. Inferior culverts will not stand the test of time, the action of elements, the pounding of the road bed by heavy traffic and the chemical action of the drainage.

It is poor economy to install culverts whose life and dependability are doubtful, when cast iron culverts have proved their absolute dependability and desirability.

We have prepared a booklet called "Reducing Ultimate Culvert Costs" that will interest Maintenance of Way Engineers. Send for a copy.

United States Cast Iron Pipe and Foundry Company

General Offices:
Burlington, New Jersey

SALES OFFICES

Philadelphia: 1421 Chestnut St.
Chicago: 122 So. Michigan Blvd.
Birmingham: 1st Ave. & 20th St.
Buffalo: 957 East Ferry Street
Cleveland: 1150 East 26th Street
Minneapolis: 6th St. & Hennepin Ave.
New York: 71 Broadway
San Francisco: 3rd & Market Sts.
Pittsburgh: 6th & Smithfield Sts.
Dallas: Akard & Commerce Sts.
Kansas City: 13th & Locust Sts.

"Ship Today Service"

Quality Ties in Any Quantity

THE concentration of standard specification ties, accurately graded, marked, and stacked separately, makes possible a perfect "Ship Today Service" of quality ties in any quantity.

International Tie Service saves time and money because

—you eliminate the expense of line inspection

—you do not have the burden of carrying the financial investment during the seasoning period

—you have complete control of your tie distribution which promotes tie thrift

We invite your inquiry—just specify the timber, grade and treatment.

International Creosoting & Construction Co.

General Offices—Galveston, Texas

Plants: Texarkana, Texas Beaumont, Texas Galveston, Texas

International

A.R.E.A.

STANDARD · SPECIFICATION · TIES

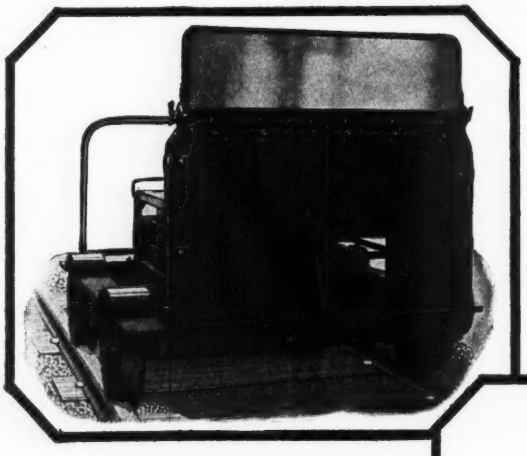
BUDA
ESTABLISHED 1881
PRODUCTS

A Protective Safeguard
THE NEW BUDA WINDSHIELD

Can be installed on BUDA Motor cars. Nos. 119, 19-L, 319 and 219—Now Equipped with Safety Rails

QUICKLY AND EASILY APPLIED OR DETACHED—REMOVABLE AS A UNIT

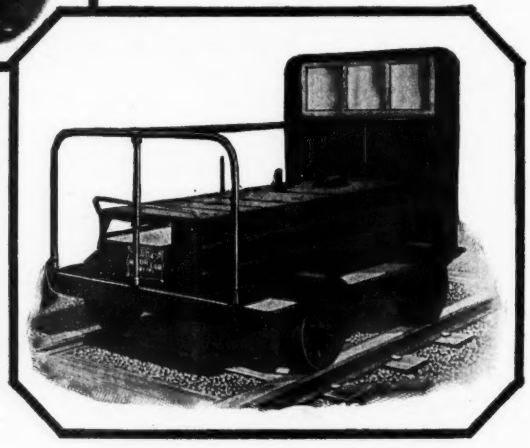
Light in Weight—Absolutely Safe—Positively Noiseless—No Appreciable Additional Load on the Motor—Fastens Securely—No Rattle



The BUDA "HARVEY" Windshield with adjustable glass windshield. Adjusted to any position—up, down or to any angle

Drop Front provided for front of engine for both types (should be lowered only during cold weather). At all other times this section should be rolled up (straps furnished hold rolled section in place).

Easily installed by drilling four (4) holes (two holes on Each Side of Front Section of Safety Rails). Next attach special Windshield Extension of Pipe furnished as part of the equipment—then buttoning the canvas section in place.



The "BUDA" Windshield easily and quickly applied or detached. (Stationary, non-adjustable.) Attached to front end of car with catch buttons. Oiled canvas with 3-section celluloid windows.

When ordering state *Type of Car*, also *Shop and Engine Numbers*, and if your car is now equipped with the new BUDA "Socket Type" *Lift Handle Brackets* into which the ends of the safety railing pipes are inserted. *This is Important* and *Necessary* as determining width of windshield required.

THE BUDA COMPANY

HARVEY (Chicago Suburb) ILLINOIS

CHICAGO · NEW YORK · JACKSONVILLE · ST LOUIS · SAN FRANCISCO
LONDON

Railway
Engineering and Maintenance

Volume 22 April, 1926 Number 4

CONTEST ON WINTER WORK EXTENDED

WHEN we announced our contest on The Practicability of Increasing the Amount of Work That Can Be Done in Winter, we overlooked the fact that much of the work that has been in progress during the last winter has been continued well into or through March and that as a result those in charge would not be able to draw conclusions regarding the results of this work in time to incorporate them in papers for submission before the date originally announced for the closing of the contest. As a result we have extended the closing date to May 1 to enable those whom we know are interested in this subject to prepare adequate discussions. We believe that the extension of the contest in this manner will result in the development of valuable information which will be helpful to other railway officers considering this subject.

We solicit for this contest discussions of all of the various phases of this subject, bringing out the limitations and the disadvantages as well as the advantages of handling work during the winter season. While abstract discussions of this subject will be welcome, the judges will give special consideration to those contributions drawn from actual experience. To stimulate interest in this subject prizes of $35 and $25 will be paid for the first and second best papers submitted, respectively, the awards being based upon the practical value of the information incorporated. All other contributions accepted and published will be paid for at our regular space rates. All contributions should be sent to the editor of *Railway Engineering and Maintenance*, 608 South Dearborn street, Chicago, and must be received on or before May 1 to be considered by the judges.

SCIENTIFIC METHODS PAY

THERE has been a reluctance on the part of some engineers to undertake the application of the water cement ratio and the fineness modulus in the proportioning of concrete, the contention being that the rigid proportions 1-2-4, 1-2½-5, etc., gives satisfactory results and are so much simpler to apply than any proportions involving screen analyses of the aggregates. This may be true in part if we ignore the possibility of obtaining a greater strength of the concrete from the same quantity of cement, but cases are encountered from time to time where the conventional proportions are so definitely unsuited to the materials as to produce a concrete that is clearly unsatisfactory to any practical foreman.

A case of this kind was recently brought to light on a large railway concrete job. A 1-2-4 mix produced a concrete of unsatisfactory workability, an increase in the amount of mixing water only making matters worse. After the field forces had struggled with this problem for some time without any tangible results, samples of the aggregate were sent to a laboratory for an analysis with the result that it was found that the most satisfactory mix of these particular materials would be approximately 1-3½-2½.

It is, of course, entirely possible that a good foreman would have made some increase in the proportion of the mortar, on his own account, to effect an appreciable improvement in the mixture, but it is hardly to be expected that he would have departed so far from the mix called for in the specifications, as to approximate the mix determined by the screen analysis. In other words, it is decidedly unlikely that he would have obtained as good a mix as that possible through scientific proportioning, or that any improvement which he obtained would have been possible without the use of a considerably larger quantity of cement.

ETERNAL VIGILANCE IS THE PRICE OF SAFETY

RECENT reports of the Interstate Commerce Commission covering accidents investigated by the Bureau of Safety emphasize the fact that the maintenance forces as well as those of the transportation and mechanical departments must be constantly on the alert if accidents due to defective track are to be avoided. The report is not pleasant reading but it contains much food for thought for those responsible for the maintenance of track. Indeed, a wide circulation of this and similar reports would undoubtedly have a tendency to reduce materially the number of such accidents.

A frequent cause of accidents is the tendency to "take a chance" and this applies not only to the track forces but to those of the transportation department as well. The foreman may neglect some needed work because some other work seems more important, and at the same time hesitate to impose a slow order for fear of censure; he may neglect safety measures because of his desire to hurry along the work, or he may take a chance prompted by innate human nature. In any event the consequences are apt to be serious and it is better to consider means of avoiding them than to regret them after they have come to pass. The man looking for a position has a better chance of obtaining one if he can state that he was discharged because of an excess of caution than if he must admit that he lost his job because of having been responsible for an accident.

Team work is more important in railroad operation

than it is in baseball, but it must be admitted that it is usually better developed on the ball field than it is on the railroad. The efficient ball player sticks to his post when he is needed there but he is constantly on the alert to "back up" other plays that may take him far from his usual position. A friendly tip from train or enginemen may permit a foreman to repair promptly some condition that has developed suddenly, and in like manner, the observation of passing trains by the section men may disclose dragging or defective equipment that may result in accidents. Splendid results may be obtained from such co-operation if it is carried on with the good of the service at heart, rather than a desire to "get something on the other fellow."

BETTER PUMP HOUSES

IMPROVEMENTS in the character of water supply facilities on the railroads, under which more efficient pumping equipment is rapidly replacing antiquated machinery has resulted also in an improvement in the types of buildings in which the pumps are housed. When steam plants were the prevailing type, the conventional pump house was a wooden shed built against the side of the railway embankment at a stream crossing to facilitate the delivery of coal. The location of the house, the character of its construction and the inevitable coal and cinder piles combined to produce bad appearance, rapid deterioration, and a dirty site, in other words, a combination of conditions which naturally led to slovenly habits on the part of the pumper.

The introduction of electric motors and internal combustion engines for the operation of pumps has simplified the problem of providing a satisfactory pump house, and this, together with a tendency to provide more substantial buildings, has done much to improve the conditions under which pumping stations are operated. Given a high grade pump house it is not so difficult to induce a pumper to take sufficient pride in his work to keep both house and machinery in good condition.

The question of a satisfactory pump house is not solely one of more expensive construction. The building must be designed to meet the need of the particular type of equipment it is to house, the location, climate and other factors. The water service committee of the American Railway Engineering Association has given this problem careful study, the results of which have been presented in a report which is abstracted elsewhere in this issue.

PROVIDING A FUND FOR THE DISABLED EMPLOYEE'S FAMILY

A NEW METHOD of providing relief for the families of disabled employees has been established recently on the Parsons district of the Missouri-Kansas-Texas, as described elsewhere in this issue, and its operation will be watched with considerable interest, for it systematizes what has heretofore been done, if done at all, in a haphazard and often ill-advised manner. As stated in the minutes of the organization meeting, the purpose of the happily named "Providential Fund" is to "promote harmony and good will and the practice of the Golden Rule among the membership, to aid those in distress, and to look after the welfare and interests of the members," and the means adopted to create and administer the fund are well calculated to achieve the ends desired. Since the fund is established and maintained by the employees themselves and is distributed by representatives chosen from among their own ranks there is no hint of paternalism or of alms-giving in the plan, thus enabling those benefited to retain their self respect.

In effect, the money provided forms a revolving fund, since the members whose families have received assistance are expected to pay back the money in monthly installments after returning to work, if the committee deems them capable of doing so, and it is reasonable to expect that the fund will suffer small losses on this account. The recipients need feel no hesitancy in accepting the benefits for they are made in the nature of a loan at a time when otherwise real suffering might ensue due to the inability to secure credit or to the necessity of borrowing money at a usurious rate of interest. The provision that the fund is to be used only for the purchase of necessities and is not to be advanced as cash will insure that the things needed will be provided without the danger of improvident spending, while the knowledge that his family is provided for will protect the sufferer from worry that might retard the recovery of his health.

THE FUTURE HOLDS MUCH IN STORE

THE last twenty-five years have seen much progress in the perfection of the materials used in railway tracks and structures, in the development of tools and equipment employed in maintenance of way work and in the refinement of the methods pursued in carrying out the work. The advantages accruing to the railroads as the result of these improvements have been thoroughly demonstrated in recent years since greater attention has been given to maintenance of way costs. They reflect credit on the railway organizations which have made them possible.

However, if any confidence is to be placed on conclusions drawn from a study of current tendencies, the progress made to date represents but a bare beginning. There is every reason to believe that the near future will bring forth improvements which will far exceed anything that has been done thus far.

There is a definite reason for this. The maintenance of way officer is primarily an administrator. His efficiency is measured by his ability to get work done with the means at his disposal. Like the operating officer, he is constantly confronted with problems requiring his immediate attention. Therefore, by training and necessity of circumstances, he is given to the practical application of the materials and equipment most readily at hand, rather than to detailed investigations covering a considerable period of time. There are exceptions to this rule, of course. The maintenance of way organizations on some of the larger roads and a few of the smaller ones have developed to the point where it has been possible to assign certain staff assistants to special investigations, and it is to these men and to the manufacturers of maintenance of way equipment and materials and to the correlation of such efforts through the agency of the maintenance of way associations that we must ascribe, in large part, most of the improvements that have been made up to this time.

In spite of the influence of association work, the development of improvements in devices, materials and practices has been primarily of an individual nature. As a case in point, consider the rail joint. As a result of such individual effort marked improvements have been made in the several units comprising the joint, namely, the joint bars, the bolts and bolt tension devices. Each has been brought to a high degree of perfection by separate manufacturers, with the result the railways are given the advantage of much better joint construction than was available before these de-

velopments took place. But with these improvements there have come new problems which call for a study of the joint and its action as a whole. That studies of this kind being made is indicated by the monograph by Hunter McDonald, chief engineer of the Nashville, Chattanooga & St. Louis, which is abstracted elsewhere in this issue. He directs attention to the interrelation of the various factors influencing the efficiency of the joint and presents a resume of the scientific investigations which are now under way for the purpose of determining just how a joint acts under traffic and what effect this action has on each component part of it. What influence the result of such studies will have on the design of joints and rail fastenings can not be definitely forecast at this time, but it is sure to prove of marked benefit.

CONSISTENCY IS A RARE JEWEL

THE American Railway Engineering Association convention is over. Approximately 1,000 engineers from railways in all parts of the United States and Canada met, listened to the presentation of carefully prepared reports of committees, and passed on their recommendations, adopting many of them as standard practice. They then returned to their various roads and resumed their routine duties.

What are the results of deliberations of this character? Is the work of the committees constructive? Of this there can be no doubt. Does the result of their deliberations, after review and approval by the association as a whole, represent good practice? The character of the personnel of the committees and of the membership of the association assures this. With such backing are the recommendations of the association put into effect by the individual roads? It is here that the rub comes. It is true that the A. R. E. A. is a force for standardization on the railways, for its influence is clearly evident in the standards of many roads. However, the progress that has been made in the use of the standards of this association is far short of the possibilities. The responsibility for this rests with the engineering executives on the various roads.

The difficulty arises primarily from the fact that the average railway engineer is an individualist, developing his own standards to meet his local conditions with little or no regard for the experiences of others. It is only in this way that one can explain the fact that a single manufacturer of lining bars is required to keep patterns for nearly 90 different designs of this simple tool to meet the desires of his customers. The waste in production resulting from such a condition is self-evident, and it is multiplied many times over throughout the entire range of engineering and maintenance of way materials.

It is this condition that causes one to ponder over the inconsistency of the engineer. If a committee, carefully selected, makes a detailed study of the problem and after extended consideration develops certain standards which are then reviewed by and ultimately accepted by the association, it would appear that these recommendations are worthy of adoption by many, if not most, roads. Yet the reverse commonly prevails and it is not at all uncommon for members of the committee itself to apply other standards on their roads. The situation is so inconsistent as to constitute a challenge of the value of the work of the A. R. E. A. If its standards are practical they are worthy of more general adoption than they are now receiving. If they are not practical the A. R. E. A. is wasting its time.

We believe in the American Railway Engineering Association. We believe in the practical value of its work. We believe that its conclusions deserve more consideration from the railways. We believe particularly that those engineers who approve these standards in convention should support them equally aggressively on their own roads and do their best to put them into effect.

New Books

Handbook on Railway Fire Protection, 311 pages. 4 in. x 7 in. Bound in flexible cloth. Published by The Railway Fire Protection Association, Rm. 1207, B. & O. R. R. Bldg., Baltimore, Md. $1.00.

The handbook of the Railway Fire Protection Association has been compiled in response to a demand on the part of railroads for a guide for officers and employees protecting railway properties against fire and in the prevention of fire losses by precautions in practice, equipment and methods. It is the result of approximately ten years of work on the part of the Railway Fire Protection Association and is a compilation of unquestioned value for the purpose, particularly to those railroads which have not given specialized attention to fire prevention work and likewise to operating officers, engineers and various employees, who have occasion to need information concerning recommended practice in this direction. The book contains chapters on common and special fire hazards, transportation hazards, special occupancies or risks, such as stations, freight depots, warehouses, shop plants, coaling stations, piers and wharves, bridges and trestles, etc., and a chapter dealing with such subjects as fighting fire, regulations of the National Board of Fire Underwriters, the installation, maintenance and use of first aid fire appliances, automatic sprinkler protection, private fire brigades, fire alarm signaling systems, watchman service, etc. The various standards and suggestions have been compiled principally from approved reports of the committees of the Association.

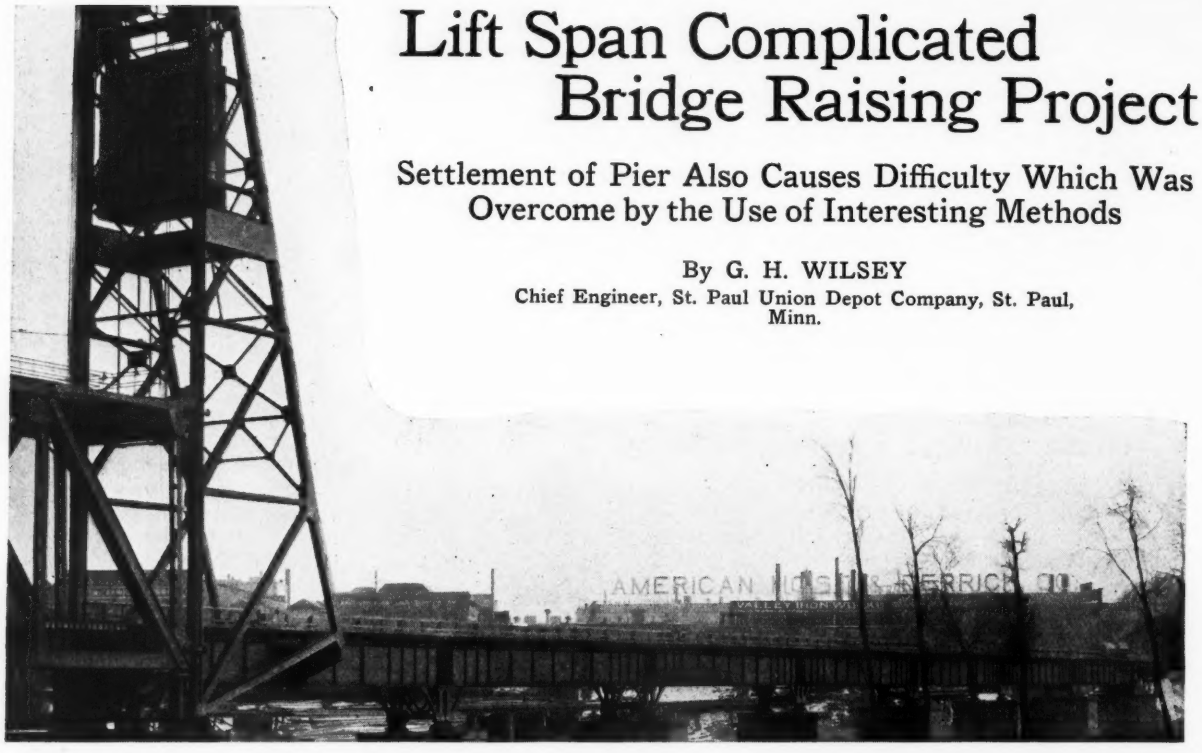
Railroad Construction. Eighth Edition, Nineteenth Thousand. By Walter Loring Webb. 849 pages, 4 in. by 7 in. illustrated. Bound in flexible fabrikoid. Published by John Wiley & Sons, Inc., New York. Price $5.

This represents the result of the seventh revision of a well-known text on railway construction, which not only embraces the engineering of curves, turnouts, crossings and grades and the computation of grading qualities, but also includes a section of nine chapters, totaling 200 pages, devoted to the economics of railway location. Practical problems of location and reconnaissance and the management of field parties also receive considerable attention. The preface of this edition mentions an entire rewriting of the chapter of "The Power of the Locomotive" and extensive changes in the chapter on "Grade," both forming important features of the section devoted to railway economics. A chapter on "Stresses in Track" at the end of the book was added in the seventh edition. Much of the book is of a mathematical character which calls for no revision in succeeding editions. However, there are portions of the book, particularly the chapters relating to the physical make-up of the railroad—the tracks, structures, signals, etc., which offer opportunity for improvement through the elimination of archaic material. The illustrations particularly are in many cases out of date. The author has drawn freely on the proceedings and manual of the American Railway Engineering Association, for which acknowledgment is duly made.

Lift Span Complicated Bridge Raising Project

Settlement of Pier Also Causes Difficulty Which Was Overcome by the Use of Interesting Methods

By G. H. WILSEY
Chief Engineer, St. Paul Union Depot Company, St. Paul, Minn.



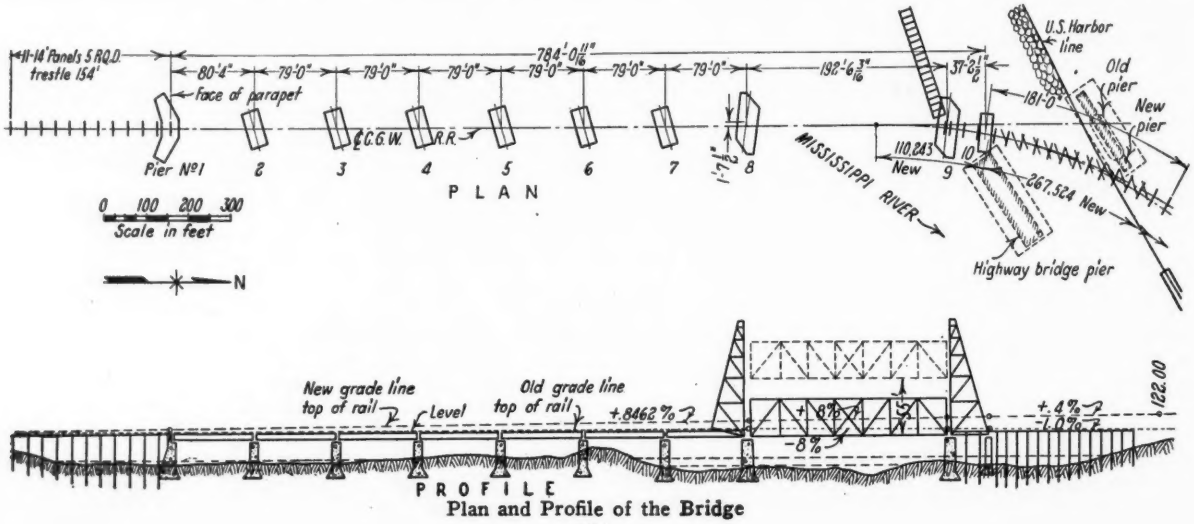
The Spans were Raised on Steel Pony Bents

THE Chicago Great Western reaches the St. Paul Union Depot by means of a bridge across the Mississippi river, the north approach of which is just west of the station. Therefore, the necessity of raising the station tracks a maximum distance of 19 ft. to provide a separation of railroad and street grades introduced the problem of raising the Chicago Great Western bridge to meet the new grade of the depot tracks.

The bridge is a single-track structure crossing the river on a skew, with a 12-deg. curve at the north or depot end. It includes seven 79-ft. deck plate girder spans and a vertical-lift, through-truss span, of the Waddell and Harrington type, 189 ft. long. When the bridge was built an abutment was placed at the south end of the girder spans, but the remaining distance to the south bank was bridged by a pile trestle 154 ft. long. From the north end of the lift span to the north bank was another pile trestle, 190 ft. long, on the 12-deg. curve, built with bents parallel to the channel of the river.

Necessary to Raise Entire Bridge

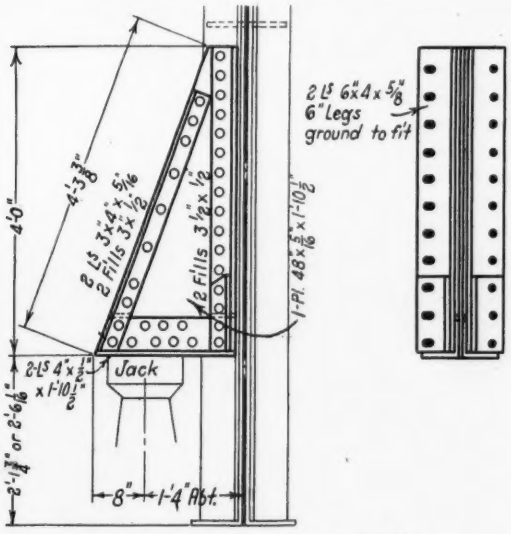
As built, the top of rail on the girder spans was seven feet higher than the depot yard, with a descending grade in both directions of approximately 0.8 per cent. In order to conform to the depot company's new work, it was necessary to raise the north end of the bridge 16 ft. at the north harbor line while 1,800 ft. to the south is a street crossing at grade which could not be disturbed. With these requirements a new profile was established which starts at



Plan and Profile of the Bridge

the north side of this street and ascends on a grade of 0.846 per cent to the south end of the lift span, thence crosses the lift span on a grade of 0.8 per cent, finishing with a grade of 0.4 per cent and vertical curves to a level lead to the depot throat. As may be seen in the drawing, this required a raise of 1.506 ft. at the south end of the girders, 6.573 ft. at the south end of the lift span and 9.453 ft. at the north end of the lift span.

The trusses of the lift span were built with intermediate posts perpendicular to the chords, but the end hangers to which the counterweight cables were attached were vertical. As a consequence the only



Details of the Jacking Brackets

change necessary to fit the span to the change in grade from 0.8 per cent in one direction to the same amount in the opposite direction was to reverse the top chords and lateral systems in the end panels end for end. As these end panel top chord members serve only as struts they were of light construction and could be removed readily and without the use of falsework.

Permission was obtained from the war department to fill the south approach. On account of the increased height of the north trestle it was decided to substitute a frame trestle 33 ft. high, of creosoted long leaf yellow pine, with a ballasted deck, having a foundation of creosoted long leaf yellow pine piles cut off at water level, which was at the lowest stage ever known when the work was done. Permission was obtained to place the bents at right angles to the track. This trestle is 218 ft. long. The girder spans were raised to the new grade by introducing steel pony bents between the sole plates on the girders and bearing castings on the masonry piers. These bents were knee-braced to the under-side of the girders. The lift span in its lowered position is now also supported on pony bents, braced to the counter-weight towers.

Had to Shorten Counterweight Cables

Preliminary work was started in December, 1924, by making alterations in the lift span. As the counterweights would not clear the raised approaches when the bridge was up it was necessary to shorten the counterweight cables. This was done by providing a system of falsework composed of plate girders under the counterweights in the towers on which the counterweights could be wedged up. Following this, during a four-hour period between trains, the span was raised on 300-ton hydraulic jacks placed under each corner, sufficiently to allow the cables to be disconnected. The cables were then shortened by the exact amount of the proposed lift. The portal bracing in the towers was raised and remodeled and new bracing was added beneath the track to keep the unsupported lengths of columns the same as previously. It was also necessary to alter the supports of the back legs of the south tower which are carried by brackets attached to the adjacent plate girder span. Piles were driven in the river to afford support for pairs of wooden columns which were designed to carry the rear tower legs from a connection at the first panel point above the track. This permitted the lower sections of these legs to be removed and reshaped for support from the girders at the new elevation. The plate girders were drilled for pony bent connections and steel jacking diaphragms were attached at the ends of the girders. As seen in the sketch, these diaphragms were placed against the web legs of the end stiffener angles and were riveted in place through the holes by means of which the stiffeners had been riveted to the web. The brackets also served to connect the ends of adjacent girders.

Settlement Introduces Complications

Six months previous to this work a pier for a new city bridge across the river had been built adjacent to the piers for the north tower of the lift span. As a result it was found that the pier for the main tower

Building the New North Approach Trestle

posts had settled about two inches on the east end, which resulted in warping the truss span when in the closed position and binding the guides on the tower while the span was being raised. Each back leg is supported on a separate shaft, rising from a common footing and it was found that the shaft under the northeast leg had separated at a construction joint and a block of concrete 15 ft. long was hanging from that leg instead of serving as a support for it. The crack, about three inches wide, was closed by grouting and the shaft was spliced vertically with old rails

held by hoops. The northwest shaft was reinforced in a similar manner, as can be seen in one of the photographs. The south main tower post which had been lowered two inches by the settlement of the pier was jacked up to grade. A photograph shows how needle beams were attached to the post and how 300-ton hydraulic jacks were applied to raise the post with its load of 600 tons. The shoe was shimmed up and grouted.

Timber for the approach trestle was framed before creosoting, and after delivery to the bridge site was assembled into bents for erection with a crane. An additional length of 274 ft. of temporary frame trestle was made ready for erection, in order to make the connection across an unfilled area to the elevated tracks, as traffic was still maintained on the surface and across the bridge at that time. The south approach trestle was filled and shimmed up.

The Lift Occupied 4½ Days

All preliminary work was completed on Saturday, February 7, 1925. On Monday morning, February 9, the last train passed over the bridge at 7:30, after which time traffic was detoured over the bridge of the St. Paul Bridge and Terminal Railway Company at South St. Paul. The work of raising the bridge and building the new timber approaches was then continued night and day until completion, except that the steel erectors did not work at night. By Tuesday morning the old pile trestle had been removed and

The Northeast Tower Column had to be Lifted to Correct for Pier Settlement

piles for the new structure driven, two drivers operating on the bed of the stream and a track driver working out from shore. The lift span was raised with a 300-ton hydraulic jack at each corner. The girders were raised with hand jacks under the jacking brackets connecting the girders together in pairs, so as not to disturb the deck. On Wednesday the lift span had been connected to its counterweights, the temporary approach trestle was complete and work had started on the creosoted trestle. Traffic was restored to the raised bridge at 7 p. m. on Friday, February 13, after being detoured for 4½ days. In this time 190 ft. of old trestle was removed, 274 ft. of new standard frame trestle was built on mud sills and 218 ft. of ballasted floor trestle was erected on piles, 746 ft. of steel bridge was raised an average of 5.5 ft. and lined up, ballast and new rails were laid and the whole structure was placed in service.

Bridge Experiences Spectacular Fire

About two months after the bridge was completed the creosoted approach trestle caught on fire. At this time the channel span of the old Robert Street bridge, which crosses above the trestle, was supported on

The Fire in the Creosoted Pine Trestle and the Falsework Under the Robert Street Span

falsework and was about half demolished. It was feared that the remainder would be dropped on the railroad bridge by the fire which had quickly attacked the wooden falsework, but the St. Paul fire department was able to extinguish the fire before the falsework was weakened enough to fall. Some of the steel work in the north tower of the lift span was buckled. The creosoted structure was also charred quite badly, but after a thorough investigation it was found that no serious damage had been done. Traffic was resumed after the second day.

The work on the bridge was performed under the direction of the depot company's engineering forces of which Colonel Frederick Mears was chief engineer; the writer, principal assistant engineer; W. B. May, assistant engineer, and C. P. Bohland, chief inspector. For the Chicago Great Western, C. G. Delo, chief engineer; W. R. Roof, bridge engineer, and W. C. Groth, engineer of maintenance, were in charge. The American Bridge Company raised the steel portion of the bridge, with E. J. McGivena as superintendent. The filling, trackwork and timber trestle demolition and construction were done by Foley Brothers, Inc., general contractors for the depot work, with D. A. Daly general superintendent and J. R. Holmes superintendent on the job.

SAFETY-ALL-THE-YEAR—and every year, is the motto of the Safety department of the Atlantic Coast Line which announces that emphasis must be placed on efforts to "make men's minds safe for machinery."

The Effect of Various Bolt Tensions on The Strength of Joints*

A Study of the Various Conditions Which Tend to Impair the Efficiency of Track Fastenings

By HUNTER McDONALD
Chief Engineer, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

AT THE 1924 Convention of the American Railway Engineering Association, the Rail committee, in presenting its report, made reference to the investigation which the writer was making and the possibility of its throwing light on the question of the desirable length of rail. This possibility arises from the fact that where rails are tightly bolted together, they have a tendency to act in conjunction with each other over long distances, producing movement only at joints where the least resistance is offered. The following is quoted from an introduction of this subject appearing in the first progress report of these observations:

"Considering joints showing a total movement of $\frac{1}{16}$ in. or less between extremes of temperature as 'frozen' or so tightly bolted as not to admit of movement, the following single and 'multiple' rail lengths were observed."

Then follows the data as to "the number of single rails and number and length of composite rails" with the result that an average length of 40 ft. was obtained for the rails on the east side of the test track and of 44 ft. for those on the west side. A corresponding calculation was made as of October 26, 1925, with results as follows: Average length of single and multiple rails: east rail, 45 ft.; west rail, 50 ft. Slightly different results might be obtained on any different day when conditions as to bolt tensions may have been altered by the tightening of bolts or by the relaxing of tension from various causes. However, it tends to confirm the writer's belief that 45 ft. is the most desirable standard length for rails.

Rail Creeping

It is concluded that it is entirely practicable to prevent rail creeping on single track by anchoring in both directions and that the total amount of such creeping in both directions may be safely set down as about one inch. It is not possible to confine creeping within closer limits on account of the fact that there is always some lost motion between the rail anchor and the side of the cross-tie and between the side of the cross-tie and the ballast. In some instances, on track anchored in both directions, a creeping of one inch has been observed in one direction after the passage of a train and corresponding creep in the other direction by the passage of another train in the opposite direction. Such changes also take place as a result of temperature changes, but this condition obtains more constantly on double track than on single track. The ideal condition is that which confines rail creeping to a single rail, but, on account of the lost motion above referred to, and the small expansion gaps required at higher temperatures, this ideal can never be attained.

B. M. Cheney†, as a result of his experiments with calibrated spring washers has reached the conclusion that for the freedom of the movement of the rail through the joints, bolt tensions should not exceed 15,000 lb. and that for the necessary strength of the joint the minimum tension should be 10,000 lb. His experiments do not support the latter conclusions but certainly there is a minimum beyond which the tension should not be permitted to relax.

Mr. Cheney's tests were made on both the so-called "free turn" bolts and "wrench fit" bolts. With the "free turn" bolts a wrench 36 in. long was used by which a tension of 20,000 lb. was secured. On the "wrench fit" bolts with a 36-in. wrench a tension of 10,000 lb. was secured; with a 42-in. wrench, 12,500 lb., and with a 48-in. wrench, 20,000 lb.

With a view of comparison with Mr. Cheney's findings, a study has been made of the bolt tension and movement of rails through the joints upon some joints which were subjected to measurements of the actual tension under the direction of Prof. A. N. Talbot of the University of Illinois. Of the cases thus observed, 75 per cent tended to confirm Mr. Cheney's findings while 25 per cent were abnormal. Definite conclusions as to the maximum bolt tension which will admit of movement of the rail in the joint might be reached if measurements were taken on a much larger number of joints in continuous stretches of track anchored in both directions.

Nut Locks and Spring Washers

In his reply to a questionnaire issued last July by the Track committee on the subject of nutlocks, the writer stated as follows:

"A nutlock or a device which simply prevents a nut from turning is not a proper appliance to put on a rail joint. . . . This principle has been recognized by the Rail committee and it has recommended the adoption of the term spring washer in lieu of nutlock in specifications for such appliances applicable to rail joints. Any spring washer should be capable of maintaining for a reasonable length of time the necessary tension in the bolt to produce the proper strength of the joint. In maintaining such tension it must take up and compensate for wear of the bearing parts."

In his reply on this same subject, C. F. W. Felt, chief engineer of the Santa Fe System, very aptly described the function of a spring washer for a track bolt as follows:

"To store energy exerted in screwing the nut on the bolt and delivering same as the surfaces of rail, joint, bolt and nut wear, thus tending to retain high pressure within the joint."

The ideal spring washer should perform satisfactorily the functions outlined in the above quoted replies to the questionnaire and should, therefore, possess the greatest possible range of reaction and the power to retain this range for the greatest length of time. Spring washers which flatten permanently under bolt tensions required to retain the desirable strength of joint are an unnecessary appendage, inasmuch as the labor of wrenching the bolt to take up the wear after the spring washer has flattened is just as great as it would be with no spring washer used.

*Abstracted from a monograph which formed a part of the report of the Rail Committee presented before the convention of the American Railway Engineering Association, in March, 1926.

†Laughlin and Cheney, Chicago.

The only excuse for the use of such washers is as a filler. The forces tending to reduce the tension in the bolt are: The giving way and gradual adjustment of the rough surfaces between the bolt head and the splice bar; the sidewise moving and twisting of the angle bar under traffic; the wearing into the nut of the sharp corners of spring washers; the wearing of the fishing surfaces between the splice bars and the rail, and the effect of brine drippings on the bearings of the bolt at each end and on the fishing surfaces of the rail and joints.

Brine drippings occur principally on the outside of the rail and it is desirable, therefore, that the spring washers be applied on the inside in preference to the outside. A spring washer which operates on two bolts and tends to maintain uniformity of tension in each pair of bolts is preferable to any device which is applied singly to each bolt because uniform tension is more readily maintained and therefore requires less labor.

Anchoring Rail

The ideal rail anchor should not depend upon contact with the tie plate for its effectiveness but should have its contact with the cross-ties at a considerable distance below the bottom of the tie plate in order to avoid reliance upon the spikes for effective anchorage. It should be capable of being taken off and reapplied a number of times without injury. The grip on the rail should be from the inside in order to decrease the damage to the base of the rail through contact of wheel flanges of derailed equipment and that the grip on the rail may receive the least injury from brine drippings.

Where traffic is unbalanced, preponderance being in the direction of the ascending grade, reliance cannot be placed in the gradient to prevent rail creeping. This was found to be true on a one per cent grade five miles long where 110-lb. rail laid without slot spiking or rail anchors against the grade had crept. The creeping was checked but it was impracticable to eliminate or correctly redistribute the excess expansion acquired through the original omission.

Slot spiking is not objectionable where sufficient anchors are used to prevent rail creeping in either direction and may take the place of one pair of rail anchors. Results of recent experiments seem to forecast the abandonment of the flaring bottoms to rail joints and a return to some form of the old fishplates. Should this take place, slot spiking would be eliminated, "a consummation devoutly to be wished."

Brine Dripping

Traffic producing brine drippings is usually in one direction. The drippings generally fall on the outside of the rail and their destructive effect on joints and the rail adjacent to and included therein is greatest at the receiving end. Through the effect of air currents, the salt spray is distributed not only over the surface of the rail and joints but penetrates behind the splice bars, attacking the fishing surfaces, and the shank of the bolt on the inside; it also affects the washer and bolt head contacts with the outer surfaces of the splice bars. It has been observed that for "wrench tight" threads the brine drippings have not affected the threads within the limits of the nut. These thread surfaces are usually found bright. With a "free turn" nut it is important that the brine drippings be sealed out of the interior of the nut by the application of grease. Unless the bolt ends and nuts are protected from corrosion the nuts usually become "frozen" and extraordinary force is required to move them. Where such is the case, sufficient force should be exerted to tighten them and if it results in twisting the bolts in two, new ones should be promptly supplied. Track walkers are generally of the older and more experienced type of employees and when charged with the duty of tightening bolts, frequently do not possess the physical strength to do so when nuts have become frozen. Under such conditions, nuts are usually left untightened.

Lubrication and Track Oiling

Prof. Talbot, in his laboratory experiments, developed the fact that the use of oil on contact surfaces did not aid the movement of rail through the joint after the bolt tension had gotten above 3,000 lb. Even if it were of value, it has not been found feasible to get a useful amount of oil on the contact surfaces between the joint and the rail, either by the method of applying it with an oil can or with a device which sprays the oil on the rail under air pressure. Some recent applications of Gre Dag, which is understood to be a combination of graphite and heavy grease, have been made on some of the joints. In all cases as the bolt was tightened the grease squeezed out. The real value of such lubrication, in admitting of the maintenance of high bolt tensions, and at the same time permitting of the movement of the rail through the joint, cannot be determined except as a result of numerous carefully conducted experiments. The spraying of the track with a heavy asphaltic oil applied about twice a year will most likely operate to exclude brine drippings from the threads of the bolts and diminish their effect on contact surfaces. With this done, no lubrication of the interior of the nut, other than that resulting from the processes of manufacture, will be required. It is highly desirable that heavy oil be applied to the interior of the joint on both sides. The writer has made some experiments with a hand-operated oil spraying device, spraying the oil behind the splices from each end. Some such method is essential in order to prolong the life of the joints, bolts and rail itself, especially on the bottom contact surfaces.

Expansion Allowances

It has been the writer's observation that the tendency to lay rail too open has been almost uniformly the case on American railroads. "Sun kinks" or "bucking track" have not been often produced by the laying of rail too tight, but by permitting it to creep after laying, depending alone on slot spiking and without the application of rail anchors in both directions. Theoretically, when the temperature of the rail reaches 100 deg., all joints in a mile should be tight. The writer observed temperatures in rail during the past summer of 135 deg., but, even with such extreme temperatures, all of the joints in the rail were not closed up. By confining the expansion spaces, correctly allowed in rail laying, within distances where creeping in either direction is not likely to exceed one inch, no fear of sun kinks need be entertained even at extreme temperatures.

The ends of rail which have not been milled in manufacture generally have rough saw marks which prevent the actual laying of the rail close up. Through pressure and attrition, these saw marks gradually wear away and admit of greater expansion spaces than would be available if the ends of all of the rails had been milled. This circumstance no doubt accounts in a large measure for the excessive joint gaps found to exist in rail laid in the past, but carelessness, the use

of makeshift shims, delayed application of rail anchors in both directions, too early removal of expansion shims as rail laying progresses and the use of an interval of 24 deg. in the tables for expansion are the chief causes.

The writer has seen rail thermometers designed to show the temperatures on the left and instructions as to the thickness of shims to be used for varying temperatures on the right. This plan is practicable for only one length of rail unless a very cumbersome design of thermometer is used. He thinks that reliance, should be placed only in the temperature readings. In using the thermometer, care should be taken not to press it on the rail, as very slight pressure affects the surface of the bulb which is in contact with the rail and produces the appearance of a decided increase in temperature which will lead to considerable error.

A necessary condition toward the attainment of the ideal is that of uniformity of bolt tension adjusted and maintained to approximately the amount of tension necessary to develop the full strength of the joint.

There is no feature of track maintenance which yields a larger return for the labor expended than properly adjusted track bolts. Bolts which become loose set up movements in the joint which tend to induce excessive batter and destroy the supporting power of the cross-ties and ballast. On the other hand, swinging ties under or near a joint induce loose bolts, thus forming a "vicious circle" which if permitted to enlarge its radius becomes destructive and dangerous. The loosening of bolts can be detected before it has gone too far by tapping the heads of the bolts with a small hammer; bolts which are too tight can be detected in the same manner. Regular inspections should be made with the hammer and the heads of bolts requiring tightening marked with yellow crayon for the notice of the trackmen. The desirable length of the wrench handle will depend on the type of nut used, whether "free turn" or "wrench tight." Whatever length may be adopted finally after the desirable length has been determined as a result of further investigation should be rigidly adhered to and the use of gas-pipe extensions prohibited, except where nuts are "frozen" and help is not available.

Wire Pockets Stop Borrow Pit Wash

By W. H. CLEVELAND
Track Inspector, Atchison, Topeka & Santa Fe, Western Lines, Wellington, Kan.

PARALLEL and side washes in borrow pits or along the right-of-way which carry the drainage from the adjacent fields and water sheds after heavy rains, develop progressively, and are a continual source of annoyance. They frequently attain such proportions as to wash away the roadbed and break beyond the right-of-way line into adjacent fields. Such conditions are usually permitted to progress without attention until they become so serious as to require emergency action. Usually the first corrective measures are of little consequence, proving of no value and even aggravating the conditions instead of correcting them, thus paving the way for extensive work, involving skilled labor and expensive material. Many times this also is not successful. Such conditions should be corrected in the initial development when they can be handled by section forces at small expense for labor and material, and in most cases by the use of available old and second hand material if this is properly placed.

Figure 1 shows a form of wire pocket which has been used effectively in the channels of washes to prevent their further development. These pockets introduce obstructions to the flow of water in the channels of the washes which cause them to fill up gradually by the collection of soil, vegetation and sedimentary deposits that are carried down by the water.

The wire pocket is essentially a barbed wire fence constructed across the channel, with three or more panels in the center, designed to act as a spillway and terminating at each end in wing panels extending well into each slope. In plan, the pocket is roughly U-shaped with the wings extending up stream, thus directing the flow toward the spillway. This is constructed with its panels at three different angles to spread the flow and thus reduce the scour on the downstream side. In the spillway the strands of wire are spaced ¼ in., or less, to a height of a foot or more above the bottom of the wash. If the bottom is of earth or sand, this close spacing should extend a few inches below the surface to prevent scouring under the wires until a deposit has accumulated and is retained above the pocket. After the deposit has accumulated to the top of the ¼-in. spacing of the wires in the spillway, a few more inches of closely spaced wires may be added as necessary, but such additions should be made in small amounts so as not to confine too much water at one time as the filling will progress annually. After one year of deposit is collected, trees (cottonwood and willows preferred) should be set out freely in the channel above the pockets.

The bottom of the pocket should be built on a level by excavating trenches in the banks for the wing panels,

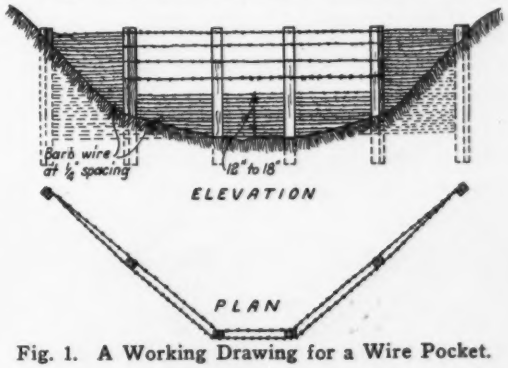


Fig. 1. A Working Drawing for a Wire Pocket.

which should be at the same level as the spillway. In the outer or wing panels the wires should be spaced closely to their full height, so that they will clog with trash and prevent the scouring of the banks. The trenches excavated in the banks for the wings should be back filled with earth after the wing panels are finished. If the bottom of the channel is of earth or sand, the bottom of the channel below the spillway should be covered with one-man rip rap, or any available refuse rock over an area sufficient to receive and spread the water pouring from the pocket to prevent scour.

Where washes are continuous for a considerable distance or where the volume of flood water is large, a succession of pockets at advantageous intervals may be necessary, this to be determined by a study of conditions

Fig. 2. Three Wire Pockets Six Months After Being Installed.

in each specific case. The photographs show some results being obtained by the installation of wire pockets on the Panhandle division of the Santa Fe.

The view in Fig. 2, taken June 8, 1925, shows the effect of a wash in an ordinary parallel borrow pit during a period of about 17 years following construction. It shows also how tributary side wash has developed, which extends beyond the right-of-way fence and into the adjoining field. This wash had progressed to an average width of 20 ft. in the bottom of the channel and to a maximum depth of 14 ft., disclosing the shale and flagstone bottom which was swept bare by the frequent flood rains which rushed through at a depth of two to three feet.

This view also shows three wire pockets that were placed in December, 1924, or six months prior to the taking of the picture. The posts were set 14 in. in the solid flagstone, the cavities around the posts being filled with cement and rock ballast. Old ties and old barbed fence wire were used in the construction, with a labor charge of $13.50. Having passed through a dry winter, the deposit in the pockets at this time was only about eight inches deep.

Fig. 3. Same View as Fig. 2 Taken Four Months Later.

Figure 3 is a photograph at the same site made in October, 1925, or four months later, and shows how debris and silt have filled in to the top of the close spaced wiring in the spillways or a depth of 20 in. This condition calls for an extension of the close spacing of wires another foot higher in the spillways and will now support the growth of small willows and cottonwood trees in the channel above and between the pockets. The sub-irrigation will cause them to grow rapidly.

Figure 4 shows how two wire pockets were placed in a bad borrow pit wash. This had a maximum depth of 22 ft., an average width in the bottom of 16 ft., and a length of 580 ft. on about a 1¼ per cent grade. Water rushed through this wash to a depth of 3 ft. after heavy flood rains, and had laid bare the flagstone in the bottom of the ditch. Seven wire pockets were constructed at selected locations in the length of this wash, which empties into a creek about 50 ft. from the first wire pocket. The old ties in the right foreground represents what is left of an old cribbing protection, which had been torn out and carried down by flood water.

Fig. 4. Two Wire Pockets in a Bad Borrow Pit Wash.

When the protection of this borrow pit was undertaken over two years ago, the wash had cut away the base of the fill which was sloughing off in several places. The erosion was also progressing into the adjacent field in several places to a maximum distance of 30 ft. There is now a deposit of three feet of soil on top of the bedrock for the full length of the wash, bank caving has ceased and young cottonwood trees have grown to a height of eight feet. These wire pockets are now ready for an additional height of close wiring while small cottonwood trees may also be planted between the first and second pockets, where they were previously omitted. These trees will eventually take care of the wash.

SAFETY COMMITTEES of the Southern Pacific received from employees during 1925 a total of 4,469 suggestions designed to correct unsafe conditions, of which 3,248 were adopted.

The Training of Maintenance of Way Workers Brings Results*

A Comprehensive Review of the Various Plans Which Have Demonstrated Their Practicability

A THOROUGH and systematic method of training employees is essential for efficiency and for promotion to advanced positions. Important development has taken place on many railroads in accordance with this recommendation. In the last few years several associations of maintenance workers have been organized along lines that have assured thorough and systematic training. It naturally follows that this training produces efficiency and prepares men for promotion. So important has the development of these associations become and so excellent have been the results that it is timely to trace the work of these associations and give an outline of their organization.

One important point is that there are no elective offices. The offices of such associations should be attached to certain positions. The secretary should be free to devote as much time to association activities as they require. In this way, politics of all kinds are eliminated from the organization, which is important when the fact is remembered that many similar movements have been wrecked through this agency. Monthly meetings are desirable, which may be held in rotation on the divisions. Approximately half the section foremen, bridge, signal and other maintenance foremen of the division on which the meeting is held should be invited to attend. All of the supervisors of that division should be present and in addition a fair representation of office employees from the division engineer's and supervisor's offices. In addition to these men who belong on the division where the meeting is held, as many of the division engineers of other divisions as can conveniently do so should attend, and also a few of the other supervisors and foremen from other divisions. The general office should be represented by one or more assistant engineers, and when feasible by one or more draftsmen or office men. In this way, an attendance of some size that represents all departments of maintenance of way activity is assured.

Select Convenient Places of Meeting

A point for meetings should be selected where trains from both directions arrive and depart at convenient hours. All arrangements for meals should be made by the secretary and paid for by voucher, which obviates handling these items through expense accounts. The meetings should begin about 10 o'clock in the morning and end about 5 or 5:30 o'clock in the evening, with an hour recess for lunch. At the evening meal, after-dinner speeches may be called for from visiting officers or other guests who should talk on subjects of their own choosing.

The programs for the meetings should be made up by the secretary, acting with the executive committee. It is a point worthy of mention that in one such association no one has ever refused to prepare a paper when invited. This is unmistakable evidence of the regard in which the association and its work is held by the men. The papers should deal with all phases of maintenance work, including time-keeping, accounting for materials, and occasionally broader subjects such as organization, morale, etc. The experience of several associations is that the papers produce lively discussions. Men of other departments should be invited to speak on subjects which they have in common with the maintenance force and give their perspective on such activities. This brings about a common understanding which is conducive to closer cooperation.

Representatives of the safety department should attend all meetings. These representatives should be qualified to call attention to any safety features which affect the general subjects discussed. Safety considerations thus injected serve to make a strong impression on the men. The safety department should also avail itself of the meetings to give the record of accidents, one period compared with another, in order to call attention to improvement or retrogression in the handling of work from the standpoint of safety.

It is generally agreed that it is extremely unwise to use these meetings for "calling down" or in any way embarrassing those in attendance. At first, the foremen are likely to be somewhat reticent, and their attitude may disclose a lurking suspicion that they are assembled in order to "rawhide" them more effectively. As soon as this suspicion is dispelled, they will become enthusiastic, look forward to the meetings and vie with each other for an opportunity to attend.

It is generally conceded that neither wages nor working conditions should ever be referred to at these meetings. Both the men and officers should tacitly recognize such subjects as taboo. Negotiations on those subjects may be at their height, but never a word should be spoken of them on the floor of the meetings, nor so far as practicable, during the intermissions. The same applies to discipline of all kinds. If these points are carefully observed, the meetings are put on a wholly different plane from the everyday affairs and all who attend will stand on the common ground of study, investigation and the exchange of ideas for the furtherance of their work. The conventional relationship of superior to subordinate is for the time being suspended.

Benefits Derived From Association Meetings

Perhaps the most important benefit derived from the organization of maintenance associations is the attitude of the men toward their work and their superiors, because this is a fundamental without which other benefits would be transient. However, the effectiveness of these associations as a medium of education, if properly conducted, can hardly be overrated. From this perspective all the good features that education produces accrue to the associations. The things that should come before the associations are, practical things and they should receive practical discussion. If this is done, the men cannot fail to learn that there are several ways of doing the most ordinary tasks as well as the most intricate operations, and that a selection is worth while and must be backed by good reasons. Broadly speaking, it teaches them to think, and

*Abstract from the report of the Committee on Economics of Railway Labor submitted at the March convention of the American Railway Engineering Association.

equally as important, it fixes for them the primary precepts on which to base their thoughts. They instinctively acquire the relationship of time versus cost.

With education also comes the need for economy and the knowledge of how to achieve economies in both labor and material. The men also get an insight into the broader plans and aims of their superiors and come to realize that they are integral parts of the whole. They find themselves entities and not merely pawns which are moved by chance or favor. Foremen should be taught that it is to their credit to develop good foremen and supervisors should likewise be taught that it is to their credit to produce good supervisors. Appreciable progress in these particulars will unquestionably result from the influence of a properly designed and conducted maintenance association. Where associations have been in effect for some length of time, it is commonplace to hear a section foreman take the floor at a meeting and without embarrassment or hesitation give a talk that shows thought and sound judgment on some point that is a distinct contribution to the subject under discussion.

One not familiar with the papers read before these associations would be agreeably surprised at the form and presentation of the subjects. It is by no means uncommon to see papers of these associations reprinted in *Railway Engineering and Maintenance*, and various employee magazines. At least one such association gets out a printed bulletin as soon after the meetings as practicable. This bulletin contains the papers read, together with a transcript of the discussion. The bulletin serves to keep the entire maintenance of way department in full knowledge of what takes place at the meetings, and it is eagerly read by both those who attended the meetings and those not so fortunate. In addition to the papers and discussions this bulletin also contains editorials, personal notes and occasionally an instructive or timely article on some subject not discussed at a meeting. This bulletin carries no advertising matter of any kind.

Qualifications For Promotion

In promotion, merit and fitness should govern. Employees having necessary qualifications should be given every legitimate opportunity and encouragement to obtain necessary training and experience. Conditions have long since made merit and fitness the only considerations for promotion. With the ever-increasing demand for greater efficiency and economy, it seems hardly probable that any recession from these criteria is to be feared. However, the recommendation should be emphasized that employees having the necessary qualifications be given every legitimate opportunity and encouragement to obtain the requisite training and experience. This is being done to a larger extent and in a broader way at the present time than ever before. The two reasons actuating this development are first, a more liberal attitude on the part of officers and second, the decreasing supply of desirable men to fill subordinate positions. Here again a maintenance association provides a medium which may be made to serve this end with peculiar aptness, and may even develop latent qualifications while it provides both the encouragement and the education necessary for promotion.

A word should be said in regard to physical fitness for promotion. It is a fact confirmed by observation and supported by both pathology and psychology that physical fitness is important, not only for work of good quality and normal quantity, but also for the capacity for learning and clear thinking. These facts accentuate the desirability of employing only men who are physically sound. It is of course necessary to examine men for sense perception in sight and hearing, since defects in these attributes disqualify a man immediately. It is becoming recognized, however, that these elementary tests do not fulfill all that should be required in men considered for promotion, and where possible, an examination similar to that required for admission to the army is recommended. The health requirement should be a condition for original employment, but since this is not always possible because of location or of the demand for men, it should be more generally adopted for those otherwise eligible for promotion.

Notwithstanding the educational benefits to be derived from academic sources, the personal education that the immediate superior can give those showing latent ability is one of the most important influences in the development of men. To this end, the entire supervisory force from the foremen up should be constantly impressed with the obligation of giving all the practical education possible to those under them. There are numberless cases where almost the entire education of men depends upon what they can learn from their supervisors. Because of that fact, this avenue of learning should be taken advantage of to the fullest possible extent. Again, that knowledge derived from a book or a discussion can best be driven home through practical example with the consequence that even when education may be acquired through other means the education that may be gained from the superior retains a significant importance.

The Value of Experience

Experience holds equal place with fitness and education. It is only from experience that the self-confidence necessary to meet the unusual situation is acquired. It is therefore important that men be given the experience that begets a complete knowledge of their responsibilities and obligations as quickly as they are thought to be fit for promotion. This has been successfully done by having them fill higher positions temporarily under the observation of their superior. A foreman can advantageously turn his gang over for a day to a laborer who shows promise. A supervisor, during periods of enforced absence, can be relieved by a foreman. These are only suggestions to bring out the point that no opportunity should be slighted which would give those in line for promotion the experience which will make them proficient.

The fact must not be overlooked that in many sections of the country foreign labor or negro labor is all that is available and that where this condition obtains a more difficult situation has to be met. However, the peculiarities which this condition produces differ for each kind of labor employed. What would apply to Italians might not apply to Mexicans, and perhaps the expedients for dealing with negro labor would differ from both. These complications forbid dealing with each condition, but with necessary modifications to fit the special case, the general principles touched upon will be of benefit wherever employed.

Those roads lying in latitudes where long and severe winters make their work seasonal have yet another problem due to their inability to offer continuous employment. This is a great impediment to education and all other systematized effort to prepare men for promotion. Here again the general principles discussed may be advantageous if modified to suit the particular case. Judging from the general aspect in many sections of the country, the problem of obtaining com-

petent foremen will become increasingly difficult and is a point deserving careful thought and study.

Methods of Promoting Individual Efforts and Interest

To accomplish best results, methods should be installed to promote individual effort and interest. Personal contact and personal interest shown on the part of the supervisory forces will go far to bring this about. The last few years have brought about a wholesome improvement in these directions. Many methods have been introduced which give impetus to individual effort and interest. These embrace prizes and awards, the creation of friendly competition, and the circulation and discussion of good records in the performance of the work. A more important development intended to further individual effort, interest and personal contact between the men and their superiors has been the creation of personnel departments. Personnel work has been undertaken in an organized way on many railroads and the results have been satisfactory. Personnel work, generally, embraces both welfare movements more or less paternalistic in character, and social activities designed to create an *esprit de corps* and build up morale. Illustrative of the type of welfare work, group insurance deserves mention. Group insurance policies have been placed by a number of large roads. Generally speaking the management participates to some extent in the payment of premiums. On many roads the insurance carries accident and health benefits. When these features are included, three of the major hazards of life, which are frequent causes of sub-conscious disquietude, and which are translated into unrest and dissatisfaction, are protected. The three hazards which group insurance provides for are sickness, accident and premature death. Since many railroads have pension systems, a fourth hazard is guarded. The rates on group insurance put this protection within the reach of all classes and provide the benefits of insurance to many who could not obtain individual insurance on account of physical impairment or dangerous occupations. Many of these policies have been in effect long enough for the employees to appreciate their worth through sad example and it is clearly evident from the number of these policies now in effect and the frequency with which new policies are being placed that group insurance is of recognized benefit.

Better Living Conditions as an Incentive

A distinct and widespread improvement in housing conditions has taken place in the past few years. A great influence on one's outlook on life is created by living conditions. A nicely kept yard, a neatly painted house and sanitary arrangements produce a psychic satisfaction that automatically sublimates itself into greater purpose and sustained effort. Conversely, a dilapidated house, ill-kept yard and insanitary conditions are frequently responsible for a sub-conscious carelessness, the effect of which can be traced in personal habits and workmanship. Nor should the interior of the living quarters be neglected. Some roads allow a reasonable amount of time with pay for attention to section house grounds and this practice is thought a good investment. Keeping extra gang camp cars attractive and sanitary is more difficult than section houses and bunk houses owing to the high labor turnover and the class of men who normally occupy them. Notwithstanding these obstacles reasonable attention to camp cars is amply warranted. To give point to this statement by illustration, probably the most contented and efficient group of workers, considered as a class, are those in telegraph and signal outfits, where considerable attention is given to living conditions.

The social activities sponsored by personnel departments range all the way from baseball, basketball, bowling and minor sports to picnics, theatricals and dances. All of these media properly conducted contribute to good-will and the building up of personal contact and confidence between the men, their superiors and the management. Employee magazines contribute to these same ends by providing pleasing publicity for these endeavors.

The Value of Personal Contact

Attention is called to the specific benefit of maintenance associations in regard to the creation of individual effort and interest and the further and equally important feature of personal contact. Wherever maintenance associations have been organized they have developed the interest of men in their work and have sustained the interest, a really more difficult thing than merely creating it. Furthermore, personal contact is made possible under conditions more propitious than can be produced at a social gathering, because the background is that of accomplishment.

Education of Employees From Outside Sources

Employees should be encouraged to seek further education from outside sources on general principles of railway operation, such as through correspondence, night schools and periodicals on railway maintenance. This recommendation is being quite generally followed out. A number of roads encourage men to affiliate with correspondence schools and allow tuition to be arranged through payroll deduction. However, many men who would be glad to avail themselves of such opportunities are not aware that correspondence courses on subjects pertaining to their work are obtainable, and it is recommended that superior officers, division engineers and supervisors be admonished to put in possession of those who might be interested, information as to where correspondence courses can be obtained, the cost and the general treatment of the subject. Many roads distribute railway magazines both of a general nature and those dealing particularly with maintenance work through their organizations. In some cases, definite systems of circulating these magazines are in effect. The small per capita cost of individual subscriptions together with the distinct advantages afforded by that method, particularly in allowing men to refer back to articles when occasion demands, should justify many more individual subscriptions than are now generally in force. In order for the men to get the full benefit of these magazines and the articles they contain, supervisors should keep themselves informed as to the interesting items which appear and discuss them with their men. This serves the double purpose of making sure that the men are reading the magazines and of impressing them on their minds through discussion.

Summary

While many roads have shown a wholesomely progressive attitude in the activities herein discussed, there is much yet to be done by even the leaders in these movements, and there are many roads who have yet to undertake organized and concerted work of this variety. However, in the light of what has been accomplished in interest, the stablization of working forces and economy by those who have engaged in these endeavors, increasing importance will attach to all movements tending to raise morale.

Improvements in Power Plants Cut Fuel Costs

Careful Studies and Prudent Investments in Additional Facilities Result in Marked Economies

By C. M. BARBOUR
Assistant Engineer, Southern Pacific Lines, Houston, Tex.

FOR three years the Southern Pacific Lines in Texas and Louisiana have been conducting a campaign to improve the condition and operation of their stationary boiler plants with the object of reducing the fuel expense. These authorized recommendations have been completed at a cost of $30,000, while the fuel savings for 1925, determined by comparing the fuel consumption for each month with that of the corresponding month of 1924, have averaged $10,177 per month or at the rate of more than $120,000 per year.

The boiler plants of the Southern Pacific Lines are typical of those on most railroads. They comprise shop power plants, roundhouse terminal plants, pumping plants, heating plants and two or three plants of a miscellaneous nature, such as that serving a creosoting plant. For years they had been serving the purposes for which they were originally intended, but little attention had been paid to the economy of operation. There are two principal reasons for this. First, it was not generally realized how much fuel was consumed by the plants as a group. The government found during federal control that about 10 per cent. of the total fuel burned on the railroads was used in stationary plants. This seemed like a small figure although in the case of these lines it amounted to over $700,000 during 1924. Second, strange as it may seem at first thought, nearly all losses which occur in a boiler plant are invisible to the eye. Only the common steam leaks at valves and fittings attract attention. Hence it was natural to overlook wastes which could not be seen.

Organize Fuel Committee

In order to handle the recommended improvements in the most expeditious manner consistent with other work and money available a fuel committee was organized consisting of the chief engineer and the superintendent of motive power. A staff of four was then appointed to correlate various details of the work. The writer has devoted his entire time to the inspection of the plants, making recommendations for improvements and supervising the installation and operation of all equipment.

The first necessary step was the inauguration of fuel records. Without knowing how much fuel is consumed at a plant, it will not be possible to determine subsequently whether fuel has been saved or how much. Each superintendent was therefore, furnished a supply of forms with instructions to submit monthly the quality of fuel consumed at each plant under his jurisdiction together with a description of the boilers and the hours each operated during the month.

An inspection of each plant was then made to determine the possibility of reducing the fuel consumption and a report including recommendations for any desired improvements, their cost and the estimated probable savings was submitted to the fuel committee. All recommendations were considered at regular meetings of the committee and the staff. This procedure resulted in an efficient and prompt handling of the improvements where the greatest savings could be made and in authorizing such as could be completed by division and shop forces in conjunction with other work.

Produce Savings Immediately

One important feature in this connection was that the first few betterments began to produce savings immediately upon completion which helped pay for the balance of the improvements. At this time, the accumulated fuel savings amount to more than three times the cost of producing them. Many commendable plans are forsaken or deferred on a railroad because of a lack of money or of confidence that the expenditures will prove financially beneficial. Money spent judiciously in railroad boiler plants will bring a higher return than in almost any other direction. The savings possible in boiler plants, due to the continuous service generally required, are greater than those due to equipping a locomotive with a superheater and a feed water heater, fuel-saving devices which are now well-known to all railroads.

SOUTHERN PACIFIC LINES

Power Plant Efficiency Rating
(Size of plant not considered)

Date _____

Plant _____ Division _____

		WEIGHT: RATE
1.	Combustion efficiency, highest CO_2 per cent _____ average CO_2 per cent _____	
	Rate = Av. $CO_2 \div 15 \times 30$	30
2.	Condition of plant.	
a	Air leaks in boiler setting	8
b	Condition of steam, air, water lines and valves	4
c	Insulation of lines	4
d	Feed water heater (Feed water temperature 60 deg. ÷ 150 deg. x 8) deg. F.	8
e	Dampers	8
	Existence of front dampers in good condition 2 ___	
	" " stack " " " " 2 ___	
	Operation " front " 2 ___	
	" " stack " 2 ___	
f	Drafting	5
	If highest percent CO_2 - 12 or better ÷5	
	" " " CO_2 is 9 or less than 12 ÷3	
	" " " CO_2 is less than 9 ÷1	
g	Soot	5
	If soot is removed from flues each washing ÷1	
	" " " " " " once between washing ÷3	
	" " " " " oftener ÷5	
h	Mechanical condition of auxiliaries	8
3.	General appearance of plant:	
a	Building and floors	10
b	Contents of building including piping, auxiliaries, boiler, etc.	10
	Total	100

4. Need of repairs, general overhauling, new equipment, etc.

(Signed) _____

(Title) _____

Rating Form for Recording the Efficiency of Boiler Plants

System supervision of the installation of all new equipment and changes was found imperative as many of the improvements were new to railroad plants. In addition it was found that many small details may easily be overlooked on a plan if not carefully explained on the ground to the officer or foreman directly in charge of installation or operation. During the time new equipment was being installed and at subsequent inspections, the employees operating the plants have been instructed as to the proper methods of handling all power plant devices. About 75 per cent. of the possible fuel savings in a boiler plant can be produced almost automatically by certain fuel saving auxiliaries but the other 25 per cent. of the savings will be obtained only through the application of efficient operating methods which, of course, depend upon the human element. Education of engineers, firemen and pumpers is, therefore, essential in order to realize the full benefits from the money invested in boiler plants. The methods of education are almost as numerous as the number of employees. The supervision and education should, above all things, be constructive and friendly in order to stimulate continuous personal interest.

Develop Method of Rating Efficiency

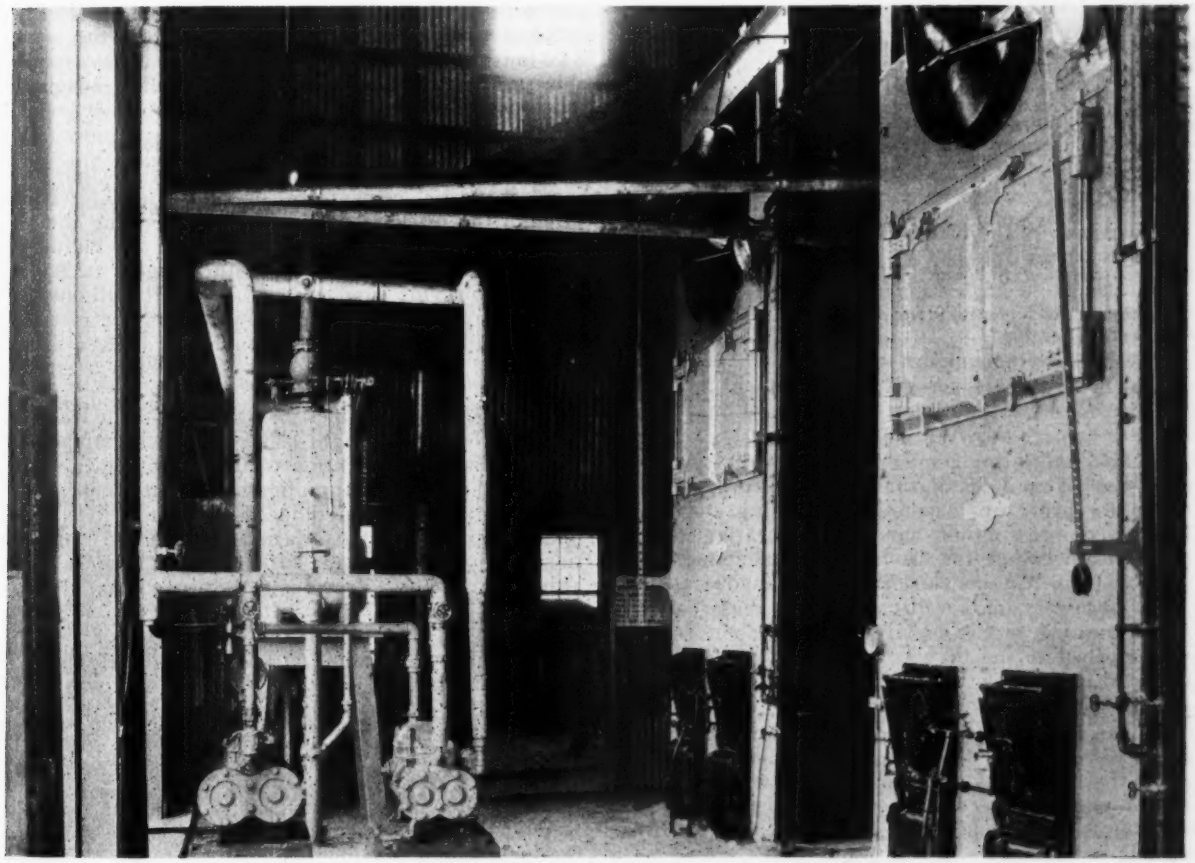
To compare the condition and operation of all plants on a common basis a method of rating boiler plants was developed which takes into consideration a number of items reflecting plant efficiency directly or indirectly. Each item was arbitrarily given a number of points totalling 100, the value of each item representing its relative importance. During 1924, the 63 plants which were rated showed an average of 64.97. In 1925 the 41 plants which were rated, had an average rating of 77.4, an increase of 19 per cent. which corresponds closely with the system fuel savings. A copy of this rating form is shown.

At the end of the year, a list of all plants in the order of their rating together with division and system average ratings is prepared and posted in each plant. This publicity has proved beneficial in arousing the interest of plant operators in keeping up every detail for which they are responsible. The only instruments used for checking up the operation of the plants are a simple portable gas analyzer and a thermometer. These cost $50 with an additional $25 at the end of two years for repairs to the gas analyzer and another thermometer.

Some Typical Results

As the greatest amount of money spent for fuel in stationary plants was for fuel oil, attention has been centered on oil-burning plants although minor improvements have been made in plants burning coal and gas. Description of three typical plants with improvements installed, their cost and the resulting savings clearly indicate the methods which have been followed to obtain substantial fuel economies.

One plant consisting of one 100-hp. Economic boiler and one 150-hp. marine boiler was used to supply steam to a roundhouse for firing up engines, washing boilers, compressing air, pumping and heating fuel oil, and heating buildings in cold weather. Water was fed to the boilers through injectors. Oil was supplied to the burners by gravity. The improvements



Boiler Room of the Houston & Texas Central Power House at Houston, Tex.

carried out on this plant during the latter half of 1924 were as follows:

Item	Cost
Insulation of both boilers with 1 1-2 in. 85 per cent. magnesia and sheet metal jackets	$400
Insulation of all steam lines in the roundhouse and boiler room	200
Installation of stack and front dampers	40
Steam hose and nozzle for blowing soot	25
Installation of four steam traps on the heating lines	125
Installation of a feed water heater and boiler feed pumps	530
Connections for the use of exhaust steam instead of live steam for heating the oil	75
Installation of a pressure fuel set (available from another plant where it was idle), efficient oil burners, oil meter, etc	200
Total cost	$1595

The reduction in fuel consumption at this point for the first six months of 1925, as compared with the first six months of 1924, is rather startling. The figures in gallons are shown below:

Fuel consumption for first half of 1924	272,423	gal.
Fuel consumption for first half of 1925	121,538	gal.
Reduction in fuel consumption	150,885	gal.
Per cent. of saving	55	

This reduction of 150,885 gal. is equivalent to 25,147 gal. per month which, at an average price of 2.8 cents per gal., equals $704 or $8,448 per year. The annual saving in this case is over five times the cost of the improvements. In other words, the first three months savings completely paid for the work.

Another plant containing two 100-hp. return tubular boilers supplying steam for firing up engines, washing boilers, handling oil and heating was improved by the following changes:

Item	Cost
Installation of a feed water heater	$500
Installation of efficient oil burners, oil meter and suitable furnace drafting	300
Installation of two steam traps on heating coils	60
Installation of adjustable stack dampers	50
Connections to use exhaust steam instead of live steam for heating oil and reclaiming waste	30
Total cost	$940

A summary of the fuel savings is given below:

Fuel consumption, first half of 1924	270,556	gal.
Fuel consumption, first half of 1925	131,143	gal.
Reduction in fuel consumption	139,413	gal.
Per cent. of saving	51	

The fuel saving amount to 23,235 gal. per month which, at 2.75 cents per gal., is equivalent to $7,668 per year or over eight times the cost of the betterments.

A third and larger plant located at a division shop consisted of two 250-hp. Stirling boilers supplying steam for firing up locomotives, washing and filling boilers, compressing air, handling oil, heating, operating a steam engine for driving shop machinery, running a steam hammer, and the miscellaneous uses always necessary in a railroad shop. Water at this plant was fed to the boilers through injectors. Oil was supplied to the burners by gravity. The changes indicated in the table were recommended and were completed on May 1, 1925:

At the time this work was undertaken, it was decided to renew the boiler settings and tubes and replace the stack. As these improvements were a matter of maintenance and would have been necessary regardless of the additional fuel saving devices, their cost is not included. In addition to the boiler room work, an appropriation was authorized to electrify the shop machinery and remove the steam engine. Previous tests indicated that the engine required 15 per cent. of the steam output of the boilers. In determining the net fuel reduction, this 15 per cent. has been eliminated from the 1924 consumption. The figures for May, June, July and August follow:

Improvements Carried Out at One of the Power Plants

Item	Cost
Installation of feed water heater and two boiler feed pumps	$1500
Installation of a pressure fuel system, efficient oil burners, an oil meter and suitable furnace drafting	900
Insulation of steam lines in the boiler room and round house. Elevating and insulating a steam line to outside radial tracks and oil supply house	800
Installation of 12 steam traps on drains and heating coils	350
Purchase and use of a tube cleaner. Connections for the use of hot water for washing the boilers. Additional valves in outlets of boilers to prevent steam leaks and to enable boilers to be properly washed. Suitable equipment for regulating feed water treatment	450
Steam hose and nozzle for blowing soot	25
Installation of flow watches and thermometers to recover air compressor cooling water without the necessity for a pump	100
Total cost	$4125

Fuel consumption for four months of 1924	466,898	gal.
Fuel consumption for four months of 1925	274,212	gal.
Net saving	192,686	gal.
Per Cent. of saving	41	

A further result of interest at this plant is the fact that the reduction in fuel and steam has been sufficient to enable all the load to be carried on one boiler instead of two, which were necessary before the work was finished. There is now one boiler always available as a spare. It is also possible to allow adequate time for cooling and washing the extra boiler.

Other Measures Were Applied

Other measures to prevent fuel wastes include the use of plastic cement to prevent air infiltration through the brick settings of boilers, running the air intakes for air compressors outside of the buildings to obtain cooler air, increasing the heights of boiler stacks to provide sufficient natural draft without the necessity of wasteful steam blowers, and the installation of suitable valves for roundhouse blower drops and boiler blow-offs to prevent unnecessary waste of steam.

With reference to fuel loss due to steam leaks, a case was brought to light last year which emphasizes the importance of attention to these apparently small wastes. The fuel consumption at a plant where gradual improvements had reduced the figure to a minimum jumped 6,300 gals. during a month. An inspection disclosed 20 steam leaks in the various lines around the shops. Previous tests proved that the average leak in a small valve will allow 1,000 lb. of steam to escape per day. With the boilers evaporating 13 lb. of water per pound of oil and with oil weighing 7.7 lb. per gal., the fuel loss due to the 20 leaks was 6,200 gal. for the month. This was equivalent to $248. Needless to say, a pipe fitter and helper were immediately assigned to the work of repairing all leaks.

One very gratifying result of the proper installation of boiler plant improvements and of the careful supervision of all operating practices is the fact that the fuel savings obtained will be continuous and cumulative.

Bureau of Safety Reports on Several Derailments

AMONG recent reports issued by the Interstate Commerce Commission covering accidents investigated by the Bureau of Safety are a number relating to derailments in which the evidence indicated that the condition of the track was primarily responsible. Because of their interest to members of the maintenance of way department, these reports are reviewed briefly below:

Inadequate Spiking Held Responsible

On December 16, 1925, a passenger train on the Atlantic Coast Line was derailed near Maitland, Fla., resulting in the death of the fireman. The accident occurred on a six-degree curve over which the train was traveling at a speed estimated at about 35 miles per hour. The track was laid with 85-lb., 33-ft. rails, with 17 to 18 ties to the rail and fully tie plated. The track was badly torn up by the wreck and several rails were found to have been broken, but a study of these led to the conclusion that they were a result of the accident rather than the cause of it.

The inspector for the commission, while examining the track in the vicinity of the accident, found a considerable number of spikes with the heads broken off. A check of the spiking on the portion of the curve to the rear of the point where the derailment occurred showed that only 5 rails out of 15 on the outside of the curve had more than one unbroken spike to the tie on the gage side although the roadmaster testified that the instructions were to double spike all curves of more than three degrees. The section foreman testified that he was aware of the fact that many of the spikes were broken off but there was no evidence of the track spreading and he did not attempt to drive any new spikes because there were other portions of his section that were more in need of attention.

The conclusion of the Bureau of Safety is that the derailment was due to the overturning of the outside rail on the curve due to inadequate spiking for which the section foreman was largely responsible.

Dirt on the Rail Causes Accident

A freight train on the Los Angeles & Salt Lake was derailed near Vigo, Nev., on November 3, 1925, resulting in the death of one employee and the injury of several other persons. The evidence showed clearly that the derailment was caused by dirt and gravel on one of the rails. The train was traveling at a speed of only about 10 or 15 miles per hour at the time of the accident.

A number of days prior to the accident a severe storm had covered the track to a depth of four feet with earth and gravel, and on the day of the accident a work train and a ditcher were being employed to remove the piles of material that were left alongside the track when it was restored to service. A single section laborer had been assigned to the work train to keep the rails clear at both the loading and unloading points, but he did not accompany the work train back to the ditcher on the last trip made prior to the accident because he was busy cleaning up the track at the unloading point. When the work train left the ditcher to get in the clear for the freight train the conductor failed to note the condition of the track with the result that one of the cylinders of the larger engine on the freight train came in contact with a pile of dirt and gravel and pushed it forward or plowed it on the rail, causing the derailment. The Bureau holds the roadmaster primarily to blame for not instructing the section foreman to assign more men to the ditcher to keep the track clear. The work extra conductor was also held at fault for his failure to see that the track was in proper condition for the following train.

Falling Rock Bends a Rail

A passenger train on the Oregon-Washington unit of the Union Pacific System was derailed near Blalock, Ore., while traveling at about 50 miles per hour, at 8:25 p. m. on October 10, 1925. The track at the point of the accident was found to be of good construction and well maintained. The track is on tangent on the south bank of the Columbia river with bluffs rising to a height of about 800 ft. to the south of the track. A close examination of this bluff opposite the scene of the accident showed that a rock had recently broken away from the face of the bluff and rolled or bounded down the slope, striking one of the rails and finally coming to rest between the track and the river. A broken rail which is believed to have been struck by this rock was found, but the conclusion is that the rock merely bent the rail sufficiently to cause the derailment and that the break occurred subsequently. This section of track is patrolled both day and night but it was concluded from the track watchman's testimony that the rock fell such a short time before the train passed that the watchman had no opportunity to apprehend the damage to the track.

Careless Foreman Causes Accident

When passenger train No. 54 on the New York, New Haven & Hartford was passing through Glenbrook, Conn., at a speed of about 50 miles per hour on the afternoon of October 6, 1925, the engineman saw section men at work on the track ahead of him and just as they stepped out of the way he saw what appeared to be a hump in the track where they had been working. As the train passed over this point the six rear cars were derailed and 24 passengers were injured.

When the track was examined after the accident it was found that the section gang had been renewing ties at that point and that several consecutive ties were not spiked. Statements as to the number of unspiked ties varied from five to seven. The track supervisor stated that the foreman (designated as an acting section foreman) had not been examined in the maintenance of way rules because he could not read or write but that he had frequently instructed him verbally and was satisfied that the foreman understood him. The foreman testified that he had forgotten about train No. 54 and believed that he would have the use of the track on which he was working for about two hours before another train was due. The foreman was held responsible for the accident.

Wheels Run on Ties Two Miles Before Causing Wreck

A peculiar accident occurred on the Southern near Danlboone Yard on October 16, 1925, when a freight train was wrecked at a facing point switch leading into a passing track. Examination of the track showed light wheel marks on the ties for a distance of more than two miles to the rear of the point where the accident occurred. These marks extended around several curves and through a trailing switch point. At the point where the initial derailment occurred, which was in a cut, it was found that a rock eight feet long, four feet wide and two feet thick had become dislodged and slid down into the ditch where it fouled the track. On

the approach of the freight train in question, the rock knocked the pony truck wheels of the engine off the track without exciting the attention of the engine crew until the derailed wheels encountered a facing point switch two miles further on.

Dragging Equipment Bends Switch Rod

On October 14, 1925, a westbound passenger train on the Pennsylvania was derailed at a facing point switch at Warwood, W. Va., resulting in the death of three employees and the injury of seven other persons. The switch is on a one-degree curve and leads into an industry track. It was equipped with a switch stand with a target seven feet three inches high, located on the fireman's side for engines facing the switch.

The last train to pass over this switch previous to the train which was derailed was an eastbound freight train which stopped with its rear portion over this switch while switching was being done at the forward end of the train. After this train had proceeded and while switching at another station, a brakeman discovered that two of the drop doors on a hopper car were down and that part of the drop door mechanism was missing. This was later found under the bent tie rod of the switch involved in the accident.

From the investigation it was concluded that the door was jarred down while the train was coupled up after standing over this switch and that part of the door got caught under the tie rod of the switch, bending it upward a sufficient distance and in such a manner as to pull the switch point away from the stock rail and leave the switch partly cocked without changing the position of the switch target. Because of this condition the engine crew of the following train had no warning of the condition of the switch until the wheels left the rails. In its conclusion the Bureau suggests the need of better inspection of the operating mechanisms of the drop doors of hopper cars.

How to Prevent Fires on the Railroad*

THE maintenance of way department, as caretaker of the property, must be on the alert constantly in its study of the problems relating to the elimination of the fire hazard. This applies not only to the supervisory force, but to all the maintenance employes as well as to others employed on the road. The section foreman must be sure to see that weeds, brush, etc., are cut out from under bridges; that the right-of-way is properly taken care of; that fire guards are installed; and that grain in fields adjacent to the right-of-way is set back and properly protected because it is much better for the railroad to haul the grain to market than it is to pay a penalty for someone's carelessness. The question of bridge fires is a vital one and the bridge department should be sure that proper care is taken of the fireproofing. Decayed timber is ignited easily by sparks or hot cinders and it is important that rotted ties or rotted timber in the bulkheads of bridges be removed promptly, not only to eliminate the fire hazard but also in the interest of good maintenance.

Since the maintenance department is in charge of the water supply, it must give careful consideration to adequate water facilities; this is particularly important in yards and terminals. The water supply must be adequate so that there will be no shortage of water during a fire, and the facilities must be located conveniently. This can be done only by a study of the location of fire hydrants and the property to be protected. Sprinkling systems and the location of hydrants adjacent to coal chutes have proved of great benefit. Suitable signs should be placed adjacent to valves and the upkeep of the facilities should be given careful attention. The installation of sprinkler systems in coal chutes has unquestionably resulted in a marked reduction in fire losses in such structures.

In yards and terminals and at shops a fire fighting force should be maintained by all means. A careful inspection of fire equipment should be made periodically and all fire roads and hydrants should be well maintained. In a number of places adequate protection is afforded by local fire departments, but this is not always the case. In this connection, provisions should be made to insure that local departments may have free access to the property in case of fire. This can be done by the construction of fire roads and gates so that the city fire forces will not be delayed in reaching a fire.

The Hazards of Inflammables

The handling of inflammables and explosives in and around various buildings should have careful attention. Gasoline and kerosene should not be kept in the section toolhouses but suitable tanks equipped with pumps should be buried in convenient locations outside the houses for the storage of these inflammable fuels.

In the past few years a number of disastrous fires have been caused by the ignition of fumes escaping from open tank cars. An accident of this kind which occurred several years ago in one of the Southern states was reported to have been caused by the striking of a spark by an employee who was caulking a loose rivet on the car. The fumes from the car had spread to the basements of various buildings and a serious explosion occurred which resulted in a heavy loss of life and property.

A somewhat similar accident occurred during the summer of 1925, when the fumes from a gasoline tank under a filling station were ignited in some manner. Accidents of this kind can be avoided by the proper protection of tank cars in the unloading of gasoline and other inflammable material and all employes should see that all instructions regarding the handling of these commodities are faithfully carried out. The greatest care must also be exercised in the use of oxy-acetylene cutting and welding outfits.

Fire prevention should be given careful consideration by the mechanical department, inasmuch as the fire departments at the various points are usually organized in this branch of the service. These forces should be equipped with modern fire trucks and other apparatus and should be brought to a state of efficiency equal to that of a paid city fire department. Fire drills should be held at irregular intervals and all test calls should be in the nature of a surprise without advance notice to the men. The members of the departments should be charged with the inspection of premises to see that no fire hazards exist at any place. They should pay special attention to the condition of the lockers used by various employes and know that there is no accumulation of oily or dirty waste, overalls, and other rubbish that may cause fire. They should see that torches are kept out

*Abstracted from the report of a committee of the Chicago, Rock Island & Pacific, submitted at a staff meeting held at Kansas City, Mo., in October, 1926. The members of the committee were A. C. Bradley, division engineer, Rock Island, Ill.; W. L. Hunker, district storekeeper, Silvis, Ill.; and B. H. Smith, master mechanic, Estherville, Ia.

of the cupboards and in safe metal containers provided for this purpose.

Birds' nests in and around shop buildings, roundhouses, water tanks and other buildings are a constant fire menace, especially in the summer time, and the officer in charge must wage a continuous fight to see that these nests are kept out of buildings. They are composed of light and inflammable substances and a spark from a locomotive or any other source ignites them easily. The mechanical department forces must see that cinders loaded from the cinder pits are wet down before loading them into cars. Employes handling tire heaters must take every precaution to see that this equipment is in proper condition, and properly used. Many makeshift outfits are used for this purpose but tire heaters constructed to insure against fire should be provided. Rivet heaters used in or around shop buildings and shops should be protected by adequate shields. Electric light wiring in shop buildings, especially the extension cords used in shop and roundhouse work, must receive frequent inspection and be removed from service immediately upon becoming defective.

Smoking in shop buildings should be absolutely prohibited. If fireproof buildings are provided where the men may eat their lunches and smoke during the noon hour and before work, it will be readily possible to enforce this rule. The maintenance of ash pans and front end spark-arresting appliances must be given constant attention to see that no defects exist, especially in the flares on the ash pan where it comes up around the mud ring. Many fires are started along the right-of-way by sparks which cross-winds have blown from ash pans that were apparently well-maintained.

The Intangible Losses Are Considerable

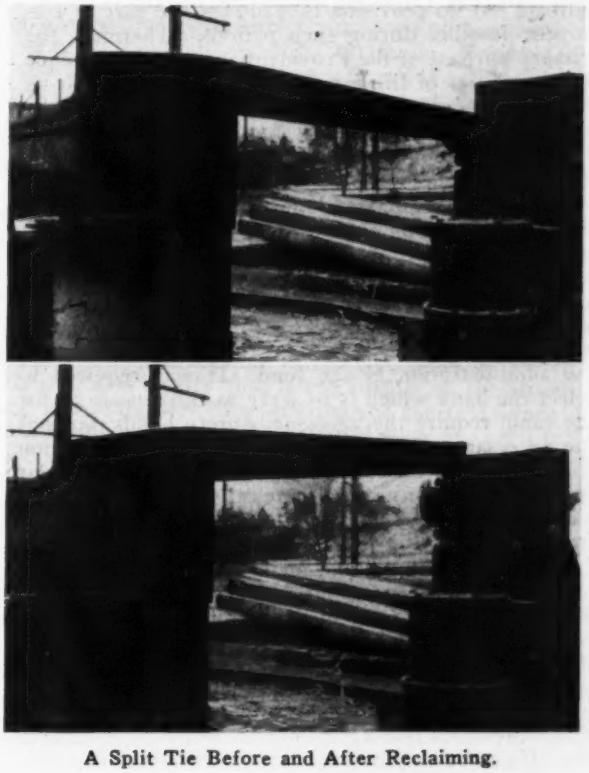
The losses from a storehouse fire are both tangible and intangible. The intangible losses include delays to work due to shortage of supplies, disturbances at other stores called on to assist in replenishing lost material and the general disruption of ordinary routine. The storehouse should be a fireproof building and in the case of larger buildings should be provided at intervals with fire walls to localize any fires that might start. Highly inflammable materials such as gasoline, benzine and varnish remover should be segregated in out-of-the-way places in underground tanks. Oxygen and acetylene should be stored in separate buildings with fire walls and should be handled carefully to avoid the chance of explosion and fire. Fusees and matches should be stored in fireproof vaults and quantities needed for local consumption should be kept in metal boxes. The ground in lumber yards should be covered with cinders and foundations for the piles should be built to afford air circulation and facilitate cleaning under the piles. Rigid attention should be given to keep these yards free from weeds, rubbish and materials of any nature that might start fires.

Storehouses should be kept absolutely clean and packing materials should either be segregated in metal boxes in the storehouse or kept outside. Storekeepers should be familiar with the instructions for the proper handling of inflammables and explosives and cars should be loaded in accordance with the transportation rules; in fact, the storekeeper should use as much care in handling inflammables and explosives as is required of other shippers. Storekeepers should see that proper fire fighting facilities are installed and kept in good order. Fire extinguishers should be kept charged and water barrels filled. Electric light wiring should be inspected and any defects brought to the attention of the maintenance department. Store department employes should familiarize themselves with the location of fire fighting facilities of all descriptions, so that any fires may be controlled before getting much of a start. A rigid inspection should be made of the store department facilities at least once a month to see that fire hazards are eliminated. The same persons should not make these inspections in any consecutive months.

Although the foregoing has treated fire prevention from the standpoint of three departments, it is a vital subject to every employe, regardless of position. The station agent in his isolated station can avoid fires by the proper cleaning up of all the property under his personal supervision. Trainmen and enginemen on the road can be of great assistance in the discovery and reporting of fire hazards and possibly by some individual work in connection therewith, can effect a saving not only in money but in the time of moving traffic, which in itself is vital to efficient operation.

Machine Reclaims Split Ties

AN INGENIOUS device for reclaiming split ties has been developed at the Brainerd, Minn., treating plant of the Northern Pacific. Essentially the machine consists of a framework supporting an air-operated lever which exerts sufficient pressure on the tie to bring the separated portions together so that S-irons may be applied. The operation of the device may be



A Split Tie Before and After Reclaiming.

seen in the accompanying illustrations, one showing a split tie to be reclaimed, and the other the same tie after the split has been closed and the S-irons applied.

The machine was built from discarded material, the lever having once been the side rod of a small locomotive and the air cylinder one no longer suitable for air brake service. The material was worked up and the machine assembled in two days by the engineer of the plant, assisted by a handy man. Compressed air for operation

is obtained from the air line leading to the adzing and boring machine through a ½-in. hose, a pressure varying from 20 to 40 lb. being required.

With the machine, two men can reclaim 30 ties per hour. Ordinarily one man, working from an hour to an hour and a half, can reclaim all the split ties encountered in a day's run. The use of the machine results in a saving of about two-thirds of the labor required by the former method of using a lever and chain.

We are indebted for the above information to Andrew Gibson, superintendent timber preservation and tie treatment of the Northern Pacific at Brainerd, Minn.

Maintenance Employees Create "Providential" Fund

THE MAINTENANCE of way employees of the Parsons district of the Missouri-Kansas-Texas have created a "Providential Fund," the purpose of which was outlined in the minutes of the organization meeting as "to promote harmony and good will and the practice of the Golden Rule among the membership, to aid those in distress, and to look after the welfare and interests of the members." On the M-K-T lines every employee is assured care during a period of incapacity due to sickness or accident through the agency of the Hospital association of the railroad, but no provision is made for the care of employees' families during such periods. Therefore the primary purpose of the Providential fund is to provide the necessities of life for these dependents insofar as the amount of money on hand will permit. The organizers of the Parsons district fund have been assured that similar funds are to be created on other districts of the road.

The first organization meeting on the Parsons district was held on December 6, 1925, in the auditorium of the Y. M. C. A. building at Parsons, Kan. This resulted in the selection of a general committee and one subcommittee to represent each of five roadmasters' divisions. The duties of the general committee were to draw up a constitution and by-laws and direct the administration of the fund. It was required to select the bank which is to serve as the repository for the fund, require the necessary surety bonds, appoint the necessary officers, etc. The duties of the division committees are to look after the membership on their respective divisions, investigate calls for assistance and administer the necessary relief with money drawn from the fund.

The fund is created and maintained by the payment of entrance fees and monthly dues by the members. The dues are $0.25 per month, while the entrance fee is $0.50 for track laborers and $1 for all others. It is the duty of the foreman to collect the dues from the men in their gangs and forward them to the vice-treasurer. Failure to pay dues results in automatic suspension. Members leaving the service of the railroad with the idea of re-employment later may retain membership by continuing to pay dues.

The fundamental idea which serves as the basis for the instructions given to the division committees as a guide for the conduct of their work is that any money appropriated should be used in a way that will accomplish the greatest good. The committees are required to make a thorough investigation of the needs of a family before making any donation and are not to give any cash to such families, but should use whatever money is necessary for the purchase of food or other necessities from local merchants, for the payment of doctors' bills, etc. Any member whose family has received assistance from the fund is expected to pay back the money in monthly installments after returning to work, if in the judgment of the committee he is capable of doing so.

While the division committees are expected to grant full relief within their own territories on their own initiative, they are required to make full reports of all action taken to the general committee in order that the latter may keep in touch with the work of the subcommittees and correct any abuses or violations of the rules of practice, errors of judgment, etc.

All members are eligible for service on the committees. Election to membership on the general committee requires a two-thirds affirmative vote. The general committee was elected for an indefinite period but any member thereof may be removed by a three-fourths vote of all of the division committees. Members of the division committees hold office for terms of 30 months but with expirations of various terms at intervals of 6 months so that changes in the personnel of the committees occur gradually.

We are indebted for the information given above concerning the Providential fund plan on the Missouri-Kansas-Texas to Edward C. Redding, organizer, Parker, Tex.

Current Retards Stop Erosion of River Bank

By B. A. Wood
Chief Engineer, Mobile & Ohio, St. Louis, Mo.

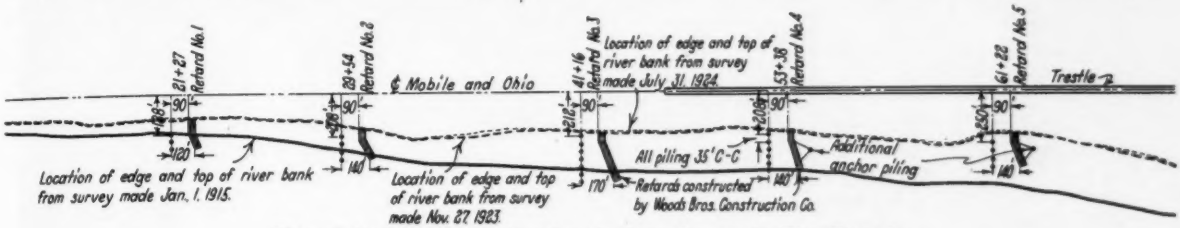
THE EAST bank of the Mississippi river about a mile north of Wickliffe, Ky., and two miles south of the confluence with the Ohio river at Cairo, Ill., has been a source of concern to the officers of the Mobile & Ohio for a number of years because of the rapid caving of the bank which has occurred at that point. The main lines of the Mobile & Ohio and the Illinois Central are located along this bank and are used as joint double track, the former which is nearer

How the Retards Have Caused a Heavy Deposit Along the River Bank

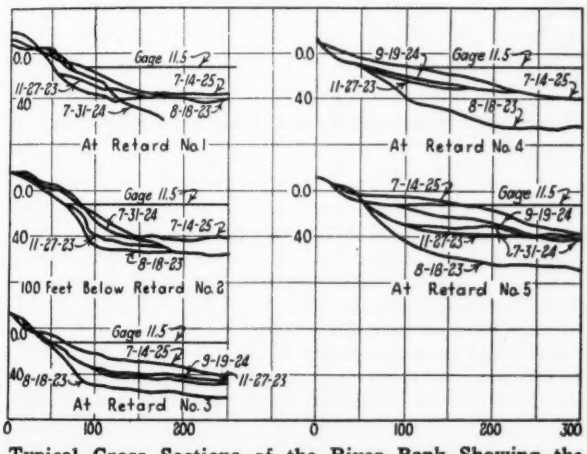
the river being used as a southbound track and the latter serving as the northbound track. The engineering department of the Mobile & Ohio has been actively engaged in watching this erosion for a number of years, and measurements made on June 21, 1923, disclosed such a rapid rate of caving since October, 1922,

as to indicate clearly that measures must be taken at once to stop the erosion or to relocate the line further away from the river in the near future.

Previous to this time, the railroad had employed consulting engineers to investigate conditions at this point and recommend means of protection, and their advice was to the effect that any measures affording positive protection would cost more than the relocation of the line at a safe distance from the river. About this time attention was directed to the method of river bank protection developed by the Woods Brothers Construction Company of Lincoln, Neb., in which whole trees securely anchored in large masses along the river bank effectively retard the current and stop the erosion. Investigation developed that this method had been successful in alluvial streams where the amount of material carried in suspension is great. Consequently some doubt arose as to its success in the Mississippi river such a short distance below its junction with the Ohio which is not generally considered as a silt bearing stream. However an inspection of some current retards of this type previously constructed near Caruthersville, Mo., for the protection of some Mississippi river levees at that point disclosed that they were functioning successfully.


21+27 Retard No.1
23+54 Retard No.2
℄ Mobile and Ohio
41+16 Retard No.3
Location of edge and top of river bank from survey made July 31, 1924.
53+38 Retard No.4
61+22 Retard No.5
Trestle
90
120
140
170
All piling 35' C-C
Additional anchor piling
Location of edge and top of river bank from survey made Jan. 1, 1915.
Location of edge and top of river bank from survey made Nov. 27 1923.
Retards constructed by Woods Bros. Construction Co.

Map of the River Bank Showing the Location of the Five Retards



Typical Cross Sections of the River Bank Showing the Progressive Sedimentation

Although the retards at Caruthersville are located at a considerably greater distance below the confluence with the Ohio, it was decided that the results of a similar installation at Wickliffe was sufficiently assured to justify its construction. Accordingly a contract was entered into with the Woods Brothers Construction Company for the construction of five retards over a distance of 3995 ft., as shown on the map with lengths of 150, 150, 250, 200 and 150 ft. respectively.

In constructing these retards an anchorage is provided for each unit in the form of a row of Bignell reinforced concrete piles located perpendicular to the river bank with the piles about 35 ft. apart. These piles are sunk far below the river bed by means of an especially designed system of water jets. Rings at the tops of these piles afforded the means of attaching a number of one-inch wire cables which are securely attached to the trees which form the retards. The trees are assembled in masses of tangled brush extending to a height of some 22 ft. above low water and projecting out into the river at a point ranging from 90 to 170 ft. downstream from the row of anchor piles. The retards are also firmly anchored to the shore by means of "dead men."

Since these retards were installed the erosion of the river bank has ceased entirely and instead the river bed has filled in behind the retards, completely sealing a stratum of quicksand which lies at about Elevation 10. above low water, and forming a gradual slope in place of a vertical break that formerly dropped off to a depth of 45 to 50 ft. within 100 ft. of the bank. Beginning at the upstream end, Retards 1, 2 and 3 receive the brunt of the current and deflect it toward midstream. So effective has this action been that from the end of retard 3 to a considerable distance below retard 5, the deposit of sediment has been so great that retards 4 and 5 have been completely covered with alluvial material. Soundings taken in July, 1925, showed that at the end of retard 5 the sediment had been deposited to a depth of 48 ft. The manner in which the deposit of material has taken place is shown clearly in the typical cross sections of the river bank. Attention is also directed to the location map on which a line is given to show the location of the river bank in 1915. This indicates clearly that if the cutting of the river bank had been allowed to continue at the rate which prevailed previous to the fall of 1923 when the retards were installed it would have reached the railroad in the near future.

The work was done by the forces of the Woods Brothers Construction Company under the supervision of the engineering department of the Mobile & Ohio. In general the work was carried on by providing a timber cutting gang, a hauling gang and a boat with barges and a crew, which loaded the timber and towed it into place. The timber was hauled by teams and tractors for distances varying from ½ mile to 2 miles.

Ninety Per Cent Still in Service After 18 Years

How Attractive Appearance and Utility May Be Combined in a Pump House

Water Station Building Design*

A Study of the Requirements of These Structures from the Standpoint of Their Use

THE WATER supply of a railroad is such an important facility that it is usually desirable to house the mechanical equipment required for this service in substantial buildings. Any interruption to the continuous supply of suitable boiler water is a serious matter as regards efficient operation, and as machinery in duplicate is often considered necessary in order to avoid possible delays, it seems equally desirable to house this equipment in buildings of fireproof construction.

The equipment in general use consists of:

1. Pumping plants operated by steam.
2. Pumping plants operated by internal combustion engines.
3. Pumping plants operated by electric motor.
4. Pumping plants at deep wells and operated by steam, oil engines, electric power, or compressed air.
5. Water treating plants.
6. Suction and intake wells.
7. Pumpers' cottages.

Steam Plants

While steam plants as a rule are being displaced by internal combustion engines or electric motors, their use in some locations is still desirable. It usually is most convenient to store the fuel supply in a room partitioned off adjacent to the boiler, and where this is done the total size of the structure required for the ordinary installation may be about 16 ft. by 28 ft. with side walls 8 to 10 ft. high, and a gable roof. Usually steam plants are installed at outlying points where steam is needed for other purposes, such as for heating coaches or buildings or where little water is required, and being considered somewhat of a temporary expedient, are housed in frame buildings. A concrete foundation and a brick or concrete floor is necessary and the roof should be covered with asbestos shingles or corrugated iron in order to reduce the fire risk to the minimum. In the colder climates it is desirable to ceil the interior of the building and provide storm windows, but in the South this is unnecessary and an ideal form of construction is a timber framework covered with corrugated, galvanized iron. At least two full-size check rail windows should be provided in the boiler and pump room.

Internal Combustion Engine Plants—Small Units

The ordinary small wayside plant usually consists of an engine from 5 to 15 hp. either directly connected to the pump or having a comparatively short belt connection. The size of the pumphouse is determined by the equipment required, but usually either a brick building or a hollow tile building, sometimes covered with stucco, varying in size from 12 ft. by 16 ft. to 12 ft. by 24 ft., and with walls 8 to 9 ft. high, is sufficient. If a vertical type oil engine is used, a ceiling height of 12 to 16 ft. may be necessary. As pumphouses are usually near the shore of a lake or river where the ground is liable to be unstable, and are also subject to the jar of machinery, particular care should be given to provide a secure foundation. This should be of concrete and should extend up to a point at least six inches above the floor line. A concrete floor should be provided and it should drain to a sump connected with the sewer. The walls of these small brick buildings may be only eight inches in thickness. The roof should preferably be of concrete.

In cold climates, to avoid condensation from the ceiling, the under side of the concrete should be insulated with a layer of flaxlinum, ½ in. thick, or similar insulating material. A coating of tar or heavy asphalt paint should be used on the roof. At least two full-size check rail windows should be provided. Frames and sash may be of wood or steel, the latter being preferred. Storm doors and storm windows are needed in the northern climate and for these small buildings stove heat is sufficient. A suitable ventilator should be provided in the ceiling or the upper

*From the report of the Committee on Water Service, submitted at the convention of the American Railway Engineering Association, in March.

part of the window sash should have a sliding ventilator. In the South where cold weather is not a factor, frame pumphouses covered with galvanized iron are frequently used for wayside stations of lesser importance. By providing a concrete floor and an asbestos wainscoting ⅝ in. thick for a height of five feet on the side walls, the fire risk is minimized to a large extent.

Internal Combustion Engine Plants—Large Units

There is a wide range in the size of buildings required for the larger pumping units which are located at terminals and important intermediate points, and where machinery is usually provided in duplicate. Local conditions will determine what must be provided. In general the building should be of brick with walls not less than 13 in. thick, and should have a concrete foundation and preferably a concrete roof. In cold climates, insulation for the under side of the concrete roof is necessary. The window sash and frames should be of steel. The floor may be of brick or concrete with adequate provision for good drainage. Electric lights should be provided with outlets adjacent to each machine. In the northern climate, if steam from other facilities is not available, a small hot-water heating plant is desirable to maintain an even temperature throughout the period when the pumpers are not on duty. Suitable ventilators, either in the ceiling or in the upper part of the window sash, must be provided.

Frequently it is necessary to set the engines or motors above the high-water level and the pumps at a lower level in order to decrease the suction lift. Where high water creates considerable static head, the pit or lower section of the pumphouse must be carefully designed with suitable reinforcement. It is usually necessary to waterproof this concrete, and this has been done successfully in many cases by the use of hydrated lime in the mixture. In some cases a double wall is used with the waterproofing membrane between.

Electric Plants and Deep Well Units

Where electricity is available at a suitable rate, this type of power is often desirable and since the electric motor may usually be directly connected to the pumping machinery, a smaller size of building is sufficient. The building should be of substantial, fireproof construction, as previously described for internal combustion units, and usually the pump may be located below the frost-line so that provision for heating the building is not always necessary.

The size of building required for a deep well pumping unit will depend entirely on the type of equipment used. A small building not over 10 ft. by 10 ft. is often all that is necessary where an electric motor may be directly connected with the pump head. A building 10 ft. by 20 ft., or larger, may be necessary where an oil engine is used for power. The building may be either of frame construction or of the same general type as that described for internal combustion units, except that it may be better to use frame construction for the roof and a prepared or built-up roof covering. A derrick frame extending 20 to 35 ft. above the roof of the building is essential, and this frame should be supported by the building foundation.

Water Treating Plants

On account of the widely differing conditions in the quality of locomotive water supplies, as well as differing climatic conditions, there is at this time no one type of plant that can be considered standard. A method of treatment for one water will not give the desired results with another and the means adopted for treatment must be adapted to the local conditions. In a cold climate it is usually desirable to have the settling and chemical tanks in a substantial two-story, well-insulated building where an even temperature may be maintained. With few exceptions these treating plant buildings are of frame construction, resting on a concrete foundation. Since economy seems to dictate this type of construction for the large building required for this purpose, it is essential that the fire-fighting apparatus be of the best. A concrete floor should be provided in the engineroom, the heating should be by means of a hot-water plant, if steam is not available from outside sources, and the roof-covering should be of asbestos or other fire-resistant material. Electric light wiring should be in conduits.

A House for a Deep Well Pump

If the chemical storage room is on the ground floor, a raised or false floor should be provided to prevent absorption of moisture and give proper ventilation. All piping and valves should be either above ground or in trenches where they will be readily accessible in case of trouble. The sewer for drainage should lie as far as practicable in a straight line, have the best grade possible and have no manholes between the plant and the outlet.

In the warmer climates it is not necessary to house the settling tanks and the buildings need only be as large as necessary to enclose the pumping and chemical handling machinery, as well as to provide for sufficient storage of chemicals. Usually a one-story frame structure with concrete floor and asbestos shingle roof is sufficient.

Suction or Pump Wells

At many locations it has been found desirable to build a suction or pump well to serve as a reservoir from which the pump will draw its supply direct. Frequently these wells are located directly beneath the pumphouse and are a part of the structure. Occasionally in order to decrease the suction lift, the pump is

placed at some distance down in the well. By means of baffle plates, screens or other devices, these wells serve to eliminate trouble from sand and leaves or other floating debris which might otherwise be drawn directly into the pump. They should be built of brick or concrete and have a watertight bottom. The pipe arrangement should be such that the supply from the river, lake or other source can be cut off while the well is being cleaned. A by-pass connection from the pump discharge pipe line to the intake line is also desirable, as frequently it may be possible to flush out or open up a clogged line by means of static water pressure from the tank or pressure from the pump.

Many water stations are located at outlying points, making it necessary to provide living quarters for the pumpers. In general these consist of frame buildings of five or six rooms and of the same type as provided for sectionmen. In all cases concrete footings or foundation should be provided. In the colder climates the house should be well built and a concrete cellar under at least part of the house is desirable. The use of asbestos shingles is recommended, as they cost little more than other roof-covering and largely decrease the fire risk.

How to Avoid Accidents With Electric Equipment*

ELECTRICITY eliminates many hazards encountered where steam or other prime movers are used, but if mishandled or improperly installed, it introduces new hazards equally dangerous. The dangerous nature of these hazards can be appreciated to some extent when we remember that electricity is invisible, that it is noiseless, and that it gives no warning of its whereabouts.

The dangers of electricity are from shock, burns, "flashed eyes," and fire. Electrical shock results from the passage of current through any portion of the human body. A shock may produce merely a tingling sensation or a slight contraction of the muscles, or it may produce more severe and painful results. Muscles may actually be injured or the heart action may be stopped. Another common effect of electrical shock is to stop the process of breathing. If breathing is not started again within a few minutes, death may result.

The severity of a shock depends upon several factors. It becomes more severe with an increase in voltage applied; with an increase in area of bodily surface brought into contact with the electrical circuit; or with an increase in the amount of moisture on the contact surfaces. Perspiration on the skin is an example of such moisture. On the other hand, the severity of a shock is decreased as the resistance of that portion of the body in contact with the electrical circuit is increased. For instance, the callouses on the palm of the hand offer more resistance per unit of area than does the wrist or other more tender portions of the body, and while a shock at the wrist might prove fatal, it might perhaps produce only a temporary sensation on the palm of the hand. Another factor of great importance is the course of the current through the body. A current passing from finger to finger of one hand, for instance, has usually only a local effect, whereas when passing from one hand to the other, the course of the current may lie through some vital organ such as the heart or the central nerve system, and it is therefore more likely to cause serious results. A similar serious result might follow when the path of the current is from the neck to the foot, or from a hand to a foot.

Electricity, in its passage through a conductor, develops a certain amount of heat which exerts a drying effect on near-by articles and may even set them on fire. An electrical current, when passing through the body, may be distributed over a wide path where there is enough fluid to prevent immediate drying. At the point of contact, however, the current may be concentrated in a small area, and here the body fluids not being present in great quantity, may be dried up so quickly as to cause a local skin or flesh burn. Burns usually accompany all severe shocks and they often result when the shock is comparatively slight.

Burns may also be caused by contact with a mere proximity to an electrical arc. When a current, in following its path, is compelled to jump an air space, the intervening air, gases, and volatilized particles of the conductors are heated to a state of incandescence and the flame thus produced is known as an electric arc. The heat of an electric arc is the highest temperature obtainable by man. It is always dangerous and every precaution should be taken to prevent its accidental occurance. An arc may be caused by the effort of a current to flow from one conductor to another, even though there is no direct connection between the two conductors. Arcs may form at points where the insulation has been weakened or broken down or at loose joints or connections in wires. An arc may also be formed when opening a switch. This operation should not be done hesitatingly but with one strong, rapid motion.

Another serious hazard of electric arcs is that of injury to the eye, i. e. "flashed" or burned eyes. When welding electrically or doing other work near an electric arc, operators should be required to wear protective goggles with properly colored lenses. Unexpected movements of devices such as circuit breakers may cause injury to persons who happen to be near enough to be struck. The unexpected starting of motors may also cause injury to men working on them as well as to men operating machines controlled by these motors.

In preventing electrical accidents it is first of all advisable to obtain high-grade equipment that has been approved by underwriters laboratories or some equally qualified authority. Inferior equipment is not to be recommended because of the dangers that may develop from defective material or workmanship. All workmen handling electrical tools, motors and appliances should be carefully instructed in the proper method of their use as well as the proper method of stopping and starting them. Where portable electrical tools and appliances are used, the work should be equipped with safety disconnecting switches that are so interlocked with a plug and receptacle that a connection and disconnection can only be made when the switch is in the off position.

Electrical equipment, to be safe and to give the best service, must be properly installed. Qualified electricians should be employed to perform all work of installation. Workmen who are not electricians, through ignorance, careless connecting, soldering, taping, or otherwise, may create many unnecessary hazards. Wherever possible it is recommended that all wiring be placed in conduits and that current-carrying parts of equipment be completely enclosed. The conduit can be placed in the most convenient location.

*Abstracted from the Report on the Reduction of Accidents to Employees presented before the convention of the American Railway Bridge and Building Association at Buffalo, N. Y., on October 22, 1925.

In the event of any electrical appliances becoming defective, inexperienced persons, either workmen or foremen, should not attempt to make repairs. Blindness, burns, or death may be the penalty. Only an electrician should be called to attend to all repair work. Inspections should be made at proper intervals to ascertain that all electrical equipment is in good condition, and any defects immediately repaired.

Paints for Use on Railway Buildings*

PAINTS are applied to a railway building: (1) to protect the materials of which the building is constructed thus prolonging its life; (2) to improve the appearance of the building; (3) to improve the lighting of the interior, resulting in increased efficiency of employees and a reduction in expenses for artificial lighting; and (4) to improve the sanitary conditions.

Properly selected paints will preserve wood, metal and other building materials and the repainting of the surfaces of such materials is desirable and necessary at certain intervals due to the perishable nature of paint, and the loss of its protective properties and deteroriation in appearance.

For office and shop buildings, paints which diffuse the maximum amount of light will preserve the health and eyesight of workers, reduce accidents and increase the output per employee, and in addition produce a substantial saving in artificial lighting bills.

The use of correct paints for toilet rooms, offices, and rooms for the storage of food products improves their sanitary condition. Paints should be selected which can be cleaned without injury to the paint, and which will produce the most impervious surfaces.

A structure requires painting when first erected, and at such times thereafter when the paint shall have ceased to have a protective, lighting or sanitary value, or when it shall have lost the standard of appearance which is generally maintained. Most railways have adopted certain standards of distinctive colors for painting buildings, each company having its own combination of colors, which has been selected for various reasons, such as longevity, cost, personal taste of departmental heads, etc. Aside from prolonging the life of its structures, the railway which makes it a practice to keep its buildings painted with attractive, pleasing colors, gains an unconscious good-will from its present and prospective patrons, which, while difficult to express in terms of money, nevertheless has a decided value in advertising. An efficient paint should be considered, one which will have the maximum protective value, permanence of color, durability, covering capacity and hiding power. The factors which produce an efficient paint are a selection of proper ingredients, and the careful grinding and mixing of these ingredients. The final product of the process of painting is the paint coating on the structure, which should have the maximum strength, impermeability and durability.

The protective value of a paint is dependent largely on the ability of the paint film to prevent air and moisture from reaching the surface of the structural materials, and also to some extent on the preservative nature of the ingredients of the paint. Paints having the greatest protective value will be found to be those composed of a combination of pigments whose particles have varying characteristic sizes, bound together by a vehicle which has a high power of absorbing oxygen. Of such paint vehicles the most satisfactory is linseed oil, which when spread in the form of a thin film will take up oxygen and form a hard, elastic, non-sticky product called linoxyn. This organic linoxyn is perishable and its purity, strength and protection from attack make for the longevity of the paint. The inorganic or powdered mineral solids of the pigments will crumble unless held together by the linoxyn, but the pigments must be so ground and blended that they will protect the binder and present the greatest mineral surface to atmospheric attack. It follows from this that the strength and durability of a paint coating are dependent on the strength and durability of the pigment particles, which should consist in part at least of chemically inert materials. The requisite thickness of a paint film, together with the utmost strength and durability can best be obtained by a properly proportioned blend of pigments of determinate sizes.

The permanence of the color of a paint will be dependent on the unfading qualities of the color-producing pigments, while the hiding power will depend on the thickness of the film and the density of the pigments when ground in oil.

How Paints Are Purchased

In general there are two methods for specifying and ordering paints. The first is to order the proper product of a reputable manufacturer. There are manufacturers who produce and sell efficient paints. They have studied the subject exhaustively and are trying constantly, by improving methods, to increase the efficiency of their product. Satisfactory results can be obtained by placing the requirements that the various classes of paint are to meet before reputable manufacturers and depending on their judgment and ability in producing the most efficient paints for the service expected. By keeping proper service records of paints sufficient data will be obtained to select the standard product of a number of manufacturers for the purpose required.

The second method is to order in accordance with specifications or formulas prepared by experts in paint technology and revised from time to time so as to include improved manufacturing methods and newly discovered materials. In preparing specifications for the purchase of paints, better results will generally be obtained by specifying rigid physical tests as a method of judging quality, rather than by giving definite formulas based on chemical composition. Chemical analyses of paints will detect substitutions of improper materials to a certain exfent but may not reveal imperfect methods of manufacture. In the purchase of paint many substitutions may be made which will still come within the letter of the specifications and many processes of mixing and grinding can be used which will produce a poor paint with even the best ingredients.

Proper Application Is Important

The service life of a paint is as much dependent upon its correct application as upon the composition of the paint itself. The most important factor in painting work is to see that the surface on which the paint is to be applied is properly prepared. Such surfaces should be clean and dry and free from condi-

*Abstracted from the report of the Committee on Buildings submitted at the Convention of the American Railway Engineering Association in March.

tions which might have a tendency to cause the paint to scale, blister or discolor.

Paints should be furnished preferably in cans, mixed to the proper consistency for direct application for recoat work. Under certain conditions paints will require some thinning, which should be done only with pure spirits of turpentine or linseed oil.

When applied, paints should be brushed out to smooth coatings of uniform thickness so as to get the maximum spreading capacity of the paint consistent with a film of the thickness to wear well and give the desired protection. Where repainting is done in two-coat work, the first coat should be allowed to dry

BUILDING PAINTING

Structure _____ Division _____
Date Started _____ Date Completed _____ Condition of Old Paint _____
What Portion Painted _____

Cost Record		No. Gals. of Paint	Color of Paint	Maker of Paint	Cost per Gal.	Cost of Misc. Material	Total Cost of Material	Cost Painter Labor	Cost of Staging & Cleaning	Total Cost
Outside 1st Coat Area.	Body									
	Canopy									
	Wainscot									
	Trim									
Outside 2nd Coat Area	Body									
	Canopy									
	Wainscot									
	Trim									
Inside 1st Coat Area.	Body									
	Ceiling									
	Wainscot									
	Trim									
Inside 2nd Coat Area	Body									
	Ceiling									
	Wainscot									
	Trim									
Roof Area.	1st Coat									
	2nd Coat									

Total Material _____ Total Labor _____ Total Cost _____ Correct _____
Explain on Back Any Reason for Excessive Cost and Weather Conditions _____ Foreman

A Card Index Record of Building Painting

hard before any succeeding coat of paint is applied. The failure of paint coatings before their expected life has been reached is a loss to the railway, both from the partial loss in materials and labor used and from the deterioration of the structural materials in the building due to the lack of protection furnished. A record of all painting work done on buildings should be kept on suitable forms, and the date painted or stenciled on buildings. The form shows the information that should be given.

Tie Renewals Show Economy of Treatment

FURTHER evidence of the economies which accrue from a consistently observed policy in the conservation of cross-ties through preservative treatment and protection against mechanical injuries is afforded by the latest records of the Lehigh Valley and the Northern Pacific for average annual tie renewals.

Lehigh Valley Continues to Reduce Tie Renewals

The Lehigh Valley's average annual tie renewals are given in the table below, which shows the average tie renewals per mile for each year from 1903 to 1925, from which it is seen that the renewals in 1922 were 77; in 1923, 91; in 1924, 109, and 1925, 91.

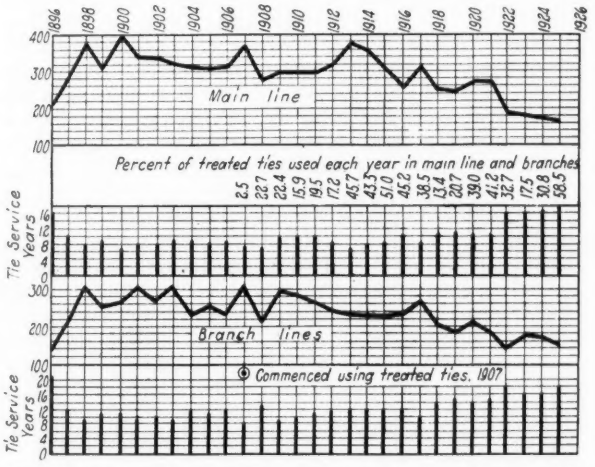
However, the general trend of renewals is indicated more clearly in the column at the right of the table, which shows the average number of ties inserted per year per mile of track for a five-year period ending in the year indicated by the line in which the figure appears. Presenting the renewals in terms of five-year averages serves to eliminate variations occurring from one year to another. Thus it will be seen that between 1917 and 1925 there has been a steady decrease in the annual renewals, as given by the five-year averages, from 250 to 100. Reduction in the tie renewals during this period is primarily due to the practice of treating ties which was begun on the Lehigh Valley in 1910. The consistent use of tie plates has also had a large influence.

Tie Renewals—Lehigh Valley

	Total Ties Inserted Per Mile of Track	Average Number of Ties Renewed Per Mile Per Year for a Five-Year Period
Year ended June 30, 1903	307	284
Year ended June 30, 1904	211	280
Year ended June 30, 1905	196	270
Year ended June 30, 1906	155	234
Year ended June 30, 1907	184	210
Year ended June 30, 1908	172	183
Year ended June 30, 1909	195	180
Year ended June 30, 1910	177	176
Year ended June 30, 1911	141	174
Year ended June 30, 1912	164	170
Year ended June 30, 1913	267	189
Year ended June 30, 1914	232	196
Year ended June 30, 1915	289	218
Year ended June 30, 1916	286	247
Six Months December 31, 1916	125	
Year ended December 31, 1917	178	250
Year ended December 31, 1918	173	231
Year ended December 31, 1919	195	224
Year ended December 31, 1920	116	189
Year ended December 31, 1921	133	159
Year ended December 31, 1922	77	139
Year ended December 31, 1923	91	122
Year ended December 31, 1924	109	105
Year ended December 31, 1925	91	100

Tie Renewals on Northern Pacific Decrease

The Northern Pacific commenced inserting treated ties in its tracks in a small way in 1907 and since that time it has gradually increased their use until about 54 per cent of all the ties in track are now treated. The effect of this practice on tie requirements is shown in a striking manner in the curves, in which renewals on main and branch lines are shown separately. The increase in the average service life of these ties is also shown in the charts, these averages being based upon 2,935 ties per mile in main line tracks and 2,755 ties in branch line tracks. These



Graphical Record of Tie Renewals on the Northern Pacific

curves indicate that coincident with the increasing use of treated ties the number of ties renewed per mile of track has declined from approximately 300 prior to 1907 to 160 in recent years, while the life has increased from 8 or 9 years to twice that average.

We are indebted for this information to Andrew Gibson, superintendent timber preservation and tie treating plants of the Northern Pacific.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities

QUESTIONS TO BE ANSWERED IN THE JUNE ISSUE

(1) *On branch lines with rail of a light and often obsolete section, to what extent is it practicable to use turnout material of a heavier standard section to promote economy and safety?*

(2) *What are the relative merits of vitrified brick or concrete as a pavement for turntable pits?*

(3) *What is the best method of anchoring track on embankments subject to overflow?*

(4) *To what extent can work trains for bridge work be supplanted by locomotive cranes or self propelling pile drivers?*

(5) *What is the best method of inducing a growth of grass on the slopes of high embankments and what varieties of grass are best suited for this purpose?*

(6) *Under what conditions should septic tanks be provided in connection with passenger stations?*

(7) *What are the relative merits of single-acting and double-acting track jacks?*

(8) *Where the plats of extensive water facilities are incorrect or incomplete, to what extent are expenditures justified in tracing out the pipes and connections so that they may be platted correctly?*

How Often Should Railway Motor Cars Be Overhauled?

Is it practicable to fix the interval between the shoppings of motor cars? If so, what should the interval be and on what does it depend?

A Regular Schedule Not Practical

By J. R. Watt
General Roadmaster, Louisville & Nashville, Louisville, Ky.

It is not practicable, in my opinion, to have any regularity in the shopping of motor cars. The condition of each individual car must be considered. The condition of the car after a period of service depends upon its construction, the care given it by the operator, and the manner in which the car is operated. Some cars are used in heavy hauling service while others are used only in going to and from work. We therefore try to judge the condition of each car and to some extent regulate the shopping of cars to suit the situation at the shop.

Conditions Are Too Variable

By E. C. Zinsmeister
Master Carpenter, Baltimore & Ohio, Newark, Ohio

It is not practicable to fix the interval between the shopping of motor cars because of the wide variation in the care and kind of service the cars receive.

Some foremen will give close attention to the lubrication of the motor, axle bearings, etc., and will use good judgment in the operation of the car, placing the gas and spark levers in the proper position, depending upon the speed of the car and the load being handled. Other foremen will not give much attention to this and will operate the car with dry bearings or a retarded spark lever which overheats the engine and valve, consumes much more fuel and leaves more carbon, thereby shortening the life of the motor and running gear of the car.

Instead of fixing the intervals between the shopping of motor cars, I favor a periodical inspection by a motor car repair man, a report to be made on a suitable form to cover the car body, axles, axle bearings, hub rivets, loose wheels, worn flanges, brakes, etc. The failure of such parts (so often neglected) is the cause of many serious accidents to employees. This form can be made suitable for the listing of motor parts needed or not in good condition. The actual conditions found at the time of such inspections should be the basis for shopping the car.

No Interval Can Be Fixed

By C. H. Ordas
Supervisor of Motor Cars, C. M. & St. P. Ry. Co., Chicago

In my opinion it is not practicable to fix the interval for the shopping of motor cars, for the reason that no two cars are subjected to the same service, mileage and care. We have in service some cars that have not been in the shops for an overhauling in 12 years and others that have been shopped several times in the same period.

We aim to supply the men with cars that are simple to operate and maintain. If this is done they can keep the cars in service in most cases for years if supplied with the needed parts to replace those worn out. Most of this is done in the field, either by the operators of the cars or by a motor car inspector, who assists the operator in installing the parts.

However, it is good policy to shop cars when the frames become shaky and loose, or need painting, or when the cylinders, axles, wheels, engine bearings or

crank shafts become worn, so that the car is either dangerous to operate or will not give proper mileage on the fuel used. That time will vary with the grades and loads, and the care with which the car has been maintained.

Treated Ties on Steel Bridges

Is the preservative treatment of ties for use on steel bridges justified?

Treatment is Justified

By J. J. YATES
Bridge Engineer, Central Railroad of New Jersey, Jersey City, N. J.

I would say decidedly so. From an experience covering 25 years in close touch with the maintenance of the bridges of the Central Railroad of New Jersey the life expected from untreated long leaf yellow pine ties is from 8 to 12 years depending on the amount of traffic over the bridge, while there are many cases where the life of creosoted ties has been 20 years when properly tie plated to prevent rail wear. Furthermore, a cheaper grade of timber can be utilized for creosoted ties than for the untreated ties.

A conservative estimate of the relative average life of treated and untreated ties in the vicinity of New York City is, in my opinion, the following: untreated long leaf yellow pine ties, 10 years; creosoted yellow pine ties, 18 years.

This is a Debatable Question

By P. G. LANG, JR.
Engineer of Bridges, Baltimore & Ohio, Baltimore, Md.

Undoubtedly so-called open floor or timber deck bridges are implied by this question, that is to say, not ballast or solid floor bridges, where the track structure is the same as in ordinary roadbed and track ties are used. Therefore, on solid floor bridges, those considerations which lead to the use of treated track ties would be equally applicable to the ties used on such bridges.

It is generally true that the preservative treatment of ties is to provide longer life, particularly in locations where the tie is subjected to the ordinary processes of decay rather than deterioration due to the mechanical use to which the tie is put—that is, the support of the rail and its loads and the transmitting of these loads to the ties' supporting structure.

In an open timber floor bridge, the tie is a structural member and is used to transfer the rail loads to the supporting steel. A tie in such a location is subjected to definite loads, producing definite bending stresses as well as stresses due to vertical and horizontal shear. It is also subjected to wear and tear due to derailments and dragging portions of equipment.

It would seem that on an open timber floor bridge, the ties are very favorably situated, so far as the ordinary processes of decay are concerned. Therefore, bearing in mind that a bridge tie differs materially from an ordinary track tie, both with respect to its use and also the degree to which it is subjected to the influences of decay, if it can be shown that the life of a bridge tie is increased sufficiently when treated to justify the expense of the treatment, then treated ties should be used, although ordinary bridge ties have been known to have a life in excess of 20 years when such ties were not treated, and then required removal not so much because of decay as because of mechanical wear.

The question of the quality of timber used in such ties must also be considered, especially when it appears to be a fact, at the present time, that the timber obtained is not of as good a quality as that secured 20 years or more ago. This is a condition favoring the treatment of bridge ties.

An Affirmative Reply

By G. A. CARROLL
Division Engineer, Chicago, Rock Island & Pacific, Kansas City, Mo.

I consider the use of preservative treatment of ties on steel bridges justified, for the labor cost is practically the same for inserting a treated tie as for an untreated tie and, disregarding derailments, a treated tie will last practically twice as long as a tie not treated. I presume the so-called fire hazard of creosoted ties on steel bridges has had a great deal to do with hesitancy in using treated ties. On the St. Louis division we have two steel bridges containing 3200 creosoted ties inserted in 1922 and have never had a tie burned although clinkers and hot cinders were found on ties after the passage of a train but they died out immediately without charring the ties.

Should the Heel of Switch Be Bolted Through the Stock Rail?

Is it desirable to bolt the heel of a switch through the stock rail or should the stock rail be left free to creep?

The Practice Is Recommended

By MAINTENANCE OFFICER

It is usually preferable to bolt the heel of the switch through the stock rail so that the relative positions of the point of the switch and the bend in the stock rail may be maintained. This practice is sometimes objected to because of difficulties introduced by the creeping of the rails, but these will occur whether the heel of the switch is bolted through the stock rail or not, and the proper way to obviate this condition is to anchor the rail with anti-creepers.

Heel of Switch Should be Bolted to the Stock Rail

By V. H. SHORE
Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

In my opinion it is not a good practice to leave stock rails on switches free to creep. My reason for this is that in some locations and under certain conditions rail creeps so much in a short time that the kink in the stock rail would run against the switch point, causing it to lip and create a dangerous condition.

Rail creeping should be reduced to a minimum in the vicinity of switches by installing sufficient rail anchors to eliminate creeping as near as possible. Track that buckles ahead of the switch points should be taken care of by cutting a rail.

Where the heel of a switch is bolted to the stock rail, creeping sometimes causes the movable wing rail on spring frogs to stand partly open because the hold-down devices of the spring wing bind in the guide boxes. This should be remedied by putting in a shorter rail ahead of the spring rail and drifting it to its proper place.

The main line rail on the opposite side of the stock rail may be allowed to run free by using a heel block in which square bolt heads are countersunk (on the main line side) and bolted only to the heel of the

switch, the heel block being very useful in holding the heel of the switch to gage and in keeping the heel of the point from creeping out.

If this rail is left free to creep the guard rail should be watched closely where a short guard rail is used as the rails may creep sufficiently in a short time to move the guard rail far enough from its proper location so that it will not properly protect the frog point.

With one rail is left free to creep at the heel of switches and the other is anchored with a heel block, the one is sure to creep more than the other, causing ties to skew in the track. This means kinked track and irregular gage.

To sum up, I do not believe there is anything to be gained by leaving either rail free to creep at all switches. In certain cases it may be permissible, and these should be left to the judgment of the roadmaster or other designated officer.

Should Section Gangs Widen Embankments?

To what extent is it desirable or advisable to encourage section forces to widen the embankments on their sections to the roadbed standards by the means at their disposal?

It Will Usually Be Found Too Expensive

By Roadmaster

It is not usually economical or advisable to widen narrow embankments by the means at the disposal of the section forces. There are times when it must be done as the lesser of two evils, but the cost of the work and the benefits to be derived should be carefully estimated to be sure that the results will justify the expenditure. A careful record of the cost of widening embankments by casting in dirt by hand or by trucking on push cars will usually show a surprisingly high cost per cubic yard.

Much constructive work of this nature may be done, however, in the disposal of earth loaded on cars by ditchers or otherwise when the length of haul is not too great, and it should be the endeavor to select narrow embankments in unloading the cars, not only to widen the embankment but also because material unloaded on narrow shoulders can usually be disposed of more cheaply than where the roadbed is of standard width.

Hand Work Is Out-Of-Date

By J. B. Kelly
General Roadmaster, Minneapolis, St. Paul & Saulte Ste. Marie, Minneapolis, Minn.

Present day policies rule against the use of track maintenance forces for widening embankments. The cost of hand labor with the use of push cars and dump boxes is exceedingly high as compared with the cost of doing the same work with any form of power equipment, such as steam ditchers with a train, etc. Time studies of performance show that maintenance of way men are out of place handling material for embankment widening whether they are hauling the material a short distance from a cut or are casting or borrowing it from a borrow pit, as all of their training has been directed along other lines, primarily the handling of regular track maintenance work. For example, if we will assume that their performance on regular track work be rated at 100 per cent., then their output in the handling of embankment material with a haul of not more than one-quarter mile is about 25 per cent. When the haul is greater the comparison is even more unfavorable.

It is possible to handle embankment materials economically by hand labor with dump cars outfits, wheel barrows, etc., but to obtain this economy it is necessary to handle the work on a yardage or other contract basis.

Under Some Conditions

By V. H. Shore
Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

Whether or not section gangs should widen embankments depends mainly on two things: The height of the embankment and the distance the material would have to be trucked with a push car. Where embankments do not exceed a height of 10 ft. section forces can maintain them to standard width by hand by building up with soil secured a few feet away from the base of embankment. The dirt should be taken out in a straight line and the edges of the hole sloped off so as to not leave an unsightly appearance along the right-of-way.

When cleaning cut ditches by hand and the situation is favorable to the use of a push car with dump boxes, dirt can be trucked about 900 ft. and the embankment built up. Where embankments are higher than 10 ft. and where it is necessary to truck dirt more than 900 ft. with a push car to maintain embankments to the roadbed standards the cost becomes prohibitive.

When Is an Injured Rail Unsafe?

What character of injury to the base of a rail is to be considered as requiring its replacement?

Flange Injuries are Especially Dangerous

By J. W. Powers
Supervisor of Track, New York Central, Rochester, N. Y.

All damaged or defective rails found in main tracks should be replaced. The principal cause of injury to the base or flange of a rail is an uneven bearing on the base of the rail, and results in the breaking of a piece of the flange, usually over a support. Broken wheels frequently damage the base of the rail, and some rails that have been subject to what might be considered a minor injury have broken. This is proof that injury to the base will greatly weaken the rail section. It has been stated by some investigators that at least 60 per cent of the rails that fail from breakage across the section had injured flanges.

Many roads have issued instructions requiring the prompt removal of defective and damaged rails from main tracks and this is a good and safe rule to follow.

A Lesson From the Common Method of Cutting Rail

By C. W. Baldridge
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

During recent years many trackmen have learned that the easiest way to cut a rail is to make a nick in each edge of the base of the rail, by means of a track chisel. The rail is then laid upon supports five or six feet apart close to the track rail, or any other object which will provide a "hold down" for the points of lining bars. Two or three men will then apply lining bars (or longer levers if any are available) over the rail to be cut and under the "hold down." One man will hold a track chisel in the notch where the cut is to be made and as another man strikes the chisel with a maul or sledge, the men on the bars

throw all the pressure possible onto the rail. Usually only one or two blows of the hammer are required to snap the rail in two, showing how easily a rail will break after having a small nick in the base.

Usually any nick, cut or damaged spot in the edge of the base of a rail makes it an unsafe rail which should not be left in a main line running track. It is not necessary to throw such a rail away, but it should be removed from a running track and the remainder of its usefulness obtained in some siding where a failure, should one occur, will not cause a serious wreck.

Any nick or cut in the edge of the base of a rail, and any damaged spot of much size anywhere in the rail should be considered as making it an unsafe rail for running track use.

Almost Any Injury is a Serious Matter

By V. H. Shore
Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

The character of injury to the base of a rail requiring its replacement is governed by the importance of the track in which the rail is located. Rails that are injured at the base to the extent that there is a possibility of doubt in the mind of an experienced trackman as to their safety should not be allowed to remain in any main track for any length of time without speed restrictions.

Rails with cracked bases, moon-shaped breaks in bases, and rails damaged on the tops of the bases through derailment should be replaced as soon as possible after the injury has been discovered and should be protected with a slow order until replaced. With the exception of a cracked base rail, those with the other types of injuries mentioned above may be used on tangent track in sidings as speed is slow and derailments are not liable to result from a break.

What Makes Putty Crack?

What causes putty to check and crumble on window sash and how may it be prevented?

Poor Material Is the Cause

By T. S. Leake
The T. S. Leake Company, Chicago.

Poor material and careless workmanship are the usual causes of poor glazing. Putty cracks and crumbles because it is of poor quality or because the glaziers failed to prime the sash before the putty was applied. Good putty is made of genuine whiting and pure linseed oil and is improved by the addition of a little white lead. When such putty is applied on properly sized sash it becomes so hard that it is very difficult to remove.

When putty is cracked and fails to hold, all the loose or cracked pieces should be broken out; the surface of the sash should then be scraped clean and painted with white lead and linseed oil mixed thin. After this is done new putty should be applied, but it is necessary to make certain that the putty is of good quality.

It Depends on the Ingredients

By G. W. Thompson
Chemist, National Lead Company, New York City

Putty made from pure whiting and pure linseed oil ordinarily gives no serious trouble on wooden sash, if the wood is first saturated with oil as a priming coat. Such putty, however, will crack in time and shake out, particularly if the glass has not been carefully secured and the sash rattles much in the wind. This is the normal perishing of this kind of putty.

If white lead is used with whiting a much tougher putty is obtained, a putty, however, which it is sometimes difficult to remove from the sash without injuring the sash on re-glazing. For steel sash a special putty containing litharge should be used.

A putty containing petroleum oil is never satisfactory for it crumbles in the presence of water, and apparently the water tends to displace the oil.

Adulterated Whiting Makes Poor Putty

By P. Aagaard
General Building Inspector, Illinois Central, Chicago.

Crumbling and disintegration of putty are due to faulty ingredients in manufacture. In some cases marble dust is mixed with the whiting to provide weight, or an inferior oil is used. If pure whiting is used with a good grade of linseed oil, thoroughly worked, this defect will be entirely avoided.

Most of the crumbling and disintegration of putty occurs in so-called "stock material," where cheapness enters into the selling of the article. As a rule, sash glazed by reliable glass dealers is set with good putty.

Data on Foundations at Bridge Sites

What information should be obtained with regard to the foundation conditions at the site of a new bridge or a small waterway and how should it be obtained?

It Is Influenced by the Size of the Structure

By J. B. Hunley
Engineer Bridges and Structures, Cleveland, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio

The amount and character of information to be obtained for bridge foundations depends largely upon the type and importance of the structure. For small unimportant structures the character of the foundation is usually fairly well known, particularly on railroad work, but if there is any doubt about it, sufficient information can usually be obtained by sinking test holes or by driving a three-inch pipe and pulling it.

On the large and important structures it is quite necessary that accurate and dependable information be obtained as to the character of the foundation, and this can best be done by a core drill. Where core drilling cannot be used rather definite information can be obtained by sinking a three or four-inch pipe with a well-driving outfit and carefully examining the material brought up. If there is evidence of rock overlaid with material which is at all unsatisfactory, the drilling should be carried not only to the rock but into the rock far enough to determine its character.

Several Factors Must Be Taken Into Account

By L. W. Skov
Office Engineer, Bridge Department, Chicago, Burlington & Quincy, Chicago

In case the structure is one in which masonry piers are to be used, soundings taken by a hand auger will give a good indication of the soil which will be encountered and will show whether piling will be necessary under the piers. Investigations should also be made to ascertain the probability of scour or silting, taking care to note whether the stream is apt to scour back in the form of cascades or small waterfalls so as to endanger the piers if they are not placed

sufficiently deep. The drainage area, high water mark and the possibility of drift should also be investigated.

The method of securing this information would depend upon the organization of the forces planning the work. In the Burlington's organization this work is handled through the district engineer's office, actual observations being taken by his local forces.

Automatic Control of Pumping Stations

Under what conditions is the automatic control of electrically operated pumping stations feasible?

Practicable in Most Cases

By C. R. KNOWLES
Superintendent of Water Service, Illinois Central, Chicago

The use of automatic control for electrically operated pumps is feasible in almost every case as the electrical control apparatus has been perfected to such an extent that it is thoroughly dependable and its use is dependent largely upon conditions under which the pumps are operated. The principal advantage in automatic electric control for pumps is in the fact that it will dispense with attendants, thereby reducing the cost of operation. As a general rule the cost for electric current will equal if it does not exceed the cost of coal or other fuel. Therefore, it is usually necessary to reduce the expense for attendance in order to justify the use of electrically operated equipment.

Automatic control is particularly applicable to pumping equipment located at a distance from the tank. It is also used to some extent in controlling pumps handling water to and from water softening tanks. A description of an automatic control panel handling seven different pumps was given in *Railway Engineering and Maintenance* for June, 1924, page 235.

Not Favored Unless Provision Is Made for Frequent Inspection

By A. I. Gauthier
Supervisor, Bridges and Buildings, Boston & Maine, Concord, N. H.

Generally speaking we are not in favor of automatic control of electrically operated pumping stations on account of the fact that the machinery does not get proper attention. However, at points such as engine terminals where a great deal of water is used, and where there is a man whose duty it is to look after pumping equipment daily, automatic control will be found satisfactory, as it provides a more uniform supply of water.

At small stations where the pumping equipment is looked after by the station forces it has been found that neither automatic control nor remote control is satisfactory, as the majority of agents do not give proper attention to the equipment, seldom oiling it and often allowing the pump to run without doing its work, and even being unaware that the pump is not operating.

Are Economical and Satisfactory

By W. T. PACE
Roadmaster, Atlantic Coast Line, Live Oak, Fla.

Automatic control of electrically operated pumping stations is possible in practically all cases. Up to and including 10 hp. motors the method is very simple.

With motors of over 10 hp. it is best to have the starter built in the motor on the commutator shaft and known as an internal starter motor. For a 10-hp. or smaller motor all that is needed for the automatic control is a waterproof knife float switch installed in the tank with a two-wire circuit to the pumphouse, and a 10-hp. magnetic contactor switch to close the circuit.

I have known controls of this type to work for several years without a single failure or any maintenance whatever. There are of course various makes and types of automatic controls but I have found the above the most simple and inexpensive of any of them.

I have also found the automatic control works equally well on various types of pumping units, such as direct-connected centrifugal pumps, geared power pumps, belt driven pumps, etc.

How to Avoid Accidents When Handling Gases*

CARE MUST be exercised in handling explosive gases such as acetylene, illuminating gas, natural gas, carbon monoxide and hydrogen; and inflammable liquids such as ether, gasoline, naptha, benzol, alcohol, kerosene, fuel oil, petroleum, turpentine, paints, varnishes, dryers, polishing solutions and cleaning solutions. Great care should be taken in storing and handling gasoline and other inflammable liquids to prevent evaporation and the mixing of their vapors with air. When large quantities are to be stored they should be placed in underground tanks. Explosive gases and vapors may ignite from spontaneous ignition of nearby substances, flame, spark or excessive heat. Do not permit oil rags and dust to accumulate. Do not permit smoking or open flames such as lanterns, gas jets, oil lamp and torches. Avoid static sparks when pouring gasoline from one container to another by keeping them in contact. Sparks often occur by two pieces of metal striking together, or from nails in shoes striking on metal on concrete floors. It is safer to use rubber heels. Post danger signs where explosives are stored and warn against the carrying of matches, smoking, etc. See that there is proper ventilation in buildings where explosive substances are stored or used.

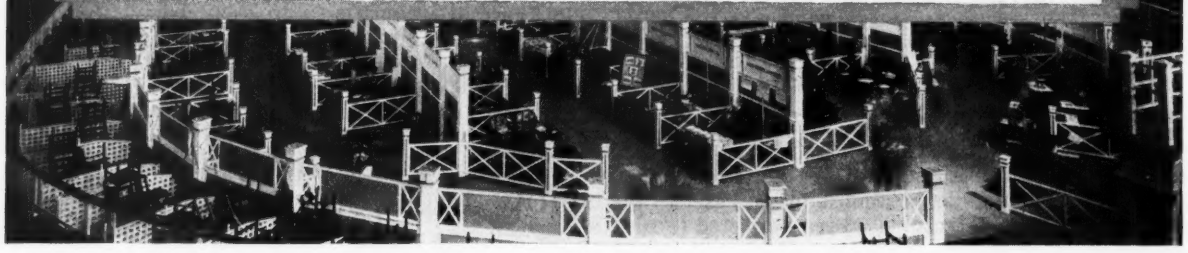
All tanks should be stored lying on their sides in places where they will not get bumped or come in contact with excessive heat. The high pressure in the oxygen tank may do damage if it gets a severe blow. The regulators should be carefully handled as they are quite delicate. Some instances have arisen where regulators have been oiled to make them work better and when oxygen came in contact with the oil very disastrous results followed. Oil should never be used on regulators, torches or any part of the outfit. The coupling of the outfit should be made so that there is not the slightest leak at any joint, especially in the acetylene line.

All flat seat unions should have good fiber gaskets and all ball joint unions should be a perfect fit. Perfect care should be taken of the outfit. The operator should remember that the acetylene outfit cannot be thrown the same as heavy rough tools. Hose used on these outfits should be frequently tested while under pressure by immersing in water and the leaks at union joints should be located by testing with soap suds and never by match or light.

*Abstracted from a report on the Reduction of Accidents to Employees presented at the convention of the American Railway Bridge and Building Association at Buffalo, N. Y., on October 22, 1925.

Getting the Manufacturers' Help

Current Developments in New and Improved Labor Saving Appliances



A New Inspection Car with Roller Bearings Throughout

AN IMPROVED side load car with roller bearings throughout, designed for efficiency in operation, long life, and additional safety, has just been introduced by Mudge & Co., Chicago. It is called the Class E-14 "Special," and is intended for service similar to that for which the same company's E-11 car was designed. This car is equipped with special roller bearings on all four wheels as well as on the crankshaft. All wheel bearings are of the combination radial and side thrust type, not only easing forward

The New Class E-14 "Special" Car

motion, but also protecting the roller bearings against the effect of side sway of the car. The four-horsepower Mudge Class E engine is thus enabled to deliver additional power because of the reduction in friction.

Two improvments have been made in the interests of safety in the operation of a side load car. The car is so designed as to permit placing the tool tray on the side of the frame immediately next to the guide wheels, giving the car additional balance. In addition to this, the wheels have been placed at an angle rather than in parallel planes, so that as the car advances on the rails, the wheels tend to hug the sides and to hold the car down.

The brake mechanism has been improved by the use of self-equalizing brakes, acting on both drive wheels. These brakes automatically adjust themselves for wear, so that the braking action is always equal on both wheels. A brake lock has been provided so that it is not necessary to place a block under the wheels when the operator leaves the car temporarily; he needs only to pull back the brake and place the brake lever in the notch, locking it securely and preventing the car from moving.

Skids and iron handles on both ends of the car are provided as standard equipment to facilitate removal from the rails, permitting the car to be rolled aside quickly by the operator by taking hold of either end.

Graver Develops New Design of Water Softener

THE GRAVER Corporation, East Chicago, Ind., has recently completed the installation of new water treating plants on the Chicago, St. Paul, Minneapolis & Omaha at Worthington, Minn., and Sioux Falls, S. D., which embody several marked departures from the water softening plants previously built by the company.

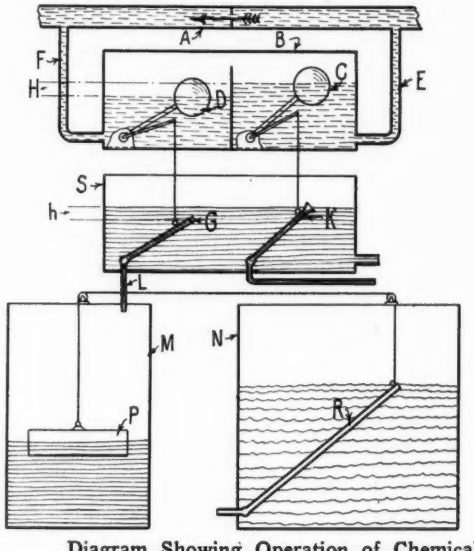


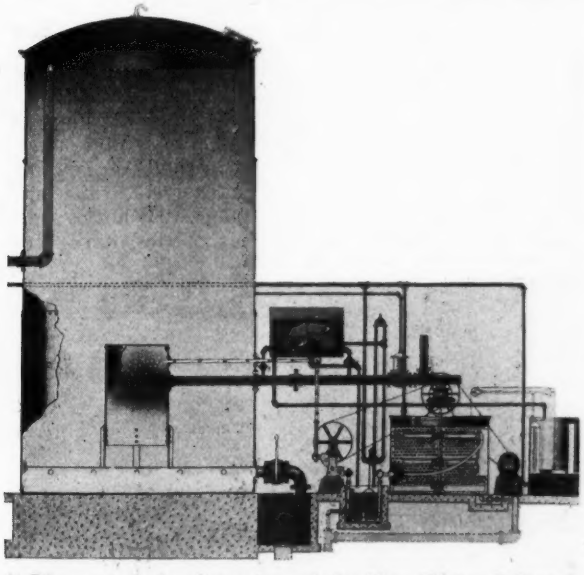
Diagram Showing Operation of Chemical Proportioning Apparatus

One change which is apparent from the photograph of the exterior is the elimination of the working house at the top of the tank. This was accomplished by introducing the raw water and chemical at the bottom of the tank, eliminating the system of mechanical agitation and downtake and substituting for it a small cylinder on the

floor of the settling tank, having the shape of an inverted tub in which the mixing of the raw water and chemical is effected. The other change is the introduction of a device for feeding the chemical into the softener at a rate proportionate to the flow of raw water.

This arrangement of plants concentrates all of the working equipment in one location—at the foot of the tank, thereby greatly reducing the labor entailed in operating the plant as compared with one in which there is apparatus at the top of the tank requiring occasional attention. The chemical measuring apparatus, shown in one of the drawings, is a modification of equipment previously installed in Graver softeners and is based on the principle that the loss of head resulting from the flow of water through an orifice is directly proportional to the rate of flow.

An orifice *A* is placed in the hard water inlet line. When the softener is operating this creates a differential pressure which is transmitted through pipes *E* and *F* to the two-compartment, air tight box *C*. The difference in pressure is shown by the difference in level *H* of the two floats *C* and *D*. Air pressure is the same on both compartments. These two floats, through stuffing boxes, each operate a lever arm attached to a swing pipe in the open top box *S*. Swing pipe *G* is fitted with an orifice, the size of which is in direct ratio to orifice *A*, while swing pipe *K* has a funnel-shaped opening. As float *C* is higher than float *D*, so will swing pipe *K* be higher than *G* and in the same amount. Soft water is admitted into box *S* in sufficient amount to allow a continual flow through pipe *K* so that a head *H* exists above orifice *G*, equal to



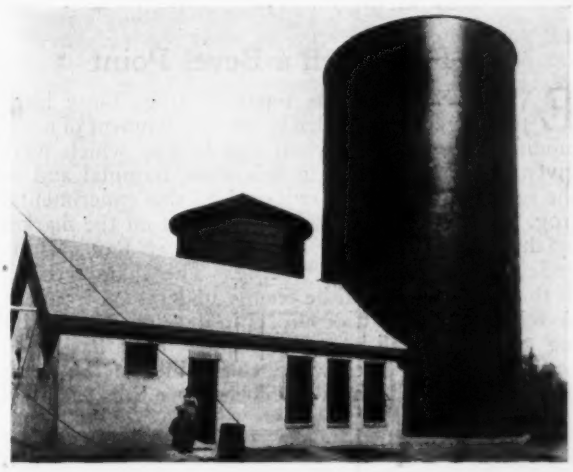
A Diagram of the Operation of the New Water Softeners

the head *H* in box *B*, which is equal to the differential pressure in the hard water feed line caused by orifice *A*.

Water flowing through orifice *G* is therefore under the same pressure as the water entering the softener. Leaving pipe *G*, the water enters pipe *L* and flows into the chemical control tank *M*. The float *P* in this tank rises as the water enters, lowering the swing pipe *R* in the chemical tank *N*. The chemical flowing through the swing pipe is pumped into the softener.

This equipment is accurate at all rates of flow. As soon as the flow into the softener stops, the levels in box *B* equalize, stopping all flow of water into the control tank *M* as at the same time the float valve in the sump shuts off the supply of water to box *S*. The chemical flows into swing pipe by displacement and the pipe in no way acts as an orifice, so that any deposit of lime in the swing pipe will not cause inaccurate treatment.

The chemical tank is fitted with horizontal upthrust agitators which keep the lime in a uniform suspension while vertical baffile plates stop all swirling. In the working house of the plant the chemical tank is placed so that half of it extends into the chemical storage space, thus permitting it to be charged without spreading dust



Graver Water Softener Installation on C. St. P. M. & O. at Worthington, Minn.

in the working room. On the chemical control tank which contains the float *P* are mounted the air tight and open top boxes containing the floats and swing pipes of the control system.

The two plants at Worthington and Sioux City are identical in operation and have the same method of chemical treatment. The former has a treating capacity of 25,000 gal. per hour, with a settling tank 28 ft. in diameter and 51 ft. 4 in. high; while the latter has a slightly larger settling tank and a treating capacity of 35,000 gal. per hour.

A New Process for Galvanized Malleable Iron Fittings

THE OHIO Brass Company, Mansfield, Ohio, has developed a heat treating process for malleable iron which permits it to be galvanized by hot-dipping without causing the metal to become brittle. This product, which the company has designated as "Flecto" iron, is said to possess all the desirable qualities of milleable iron with the added protection of efficient galvanizing.

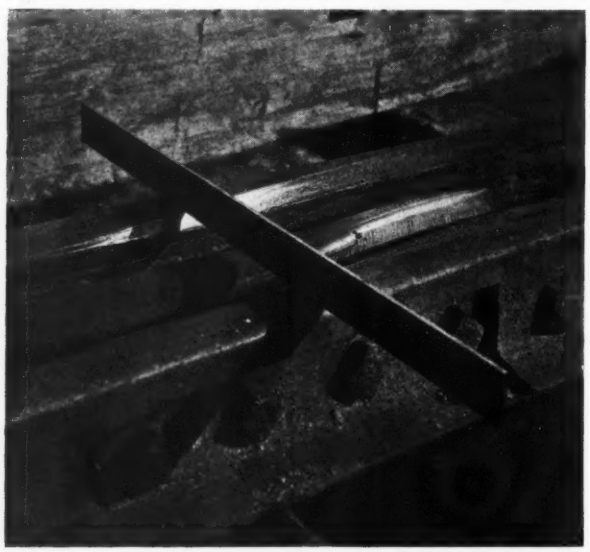
The hot-dip process of galvanizing has long been recognized as a most desirable method of rust protec-

Relative Ductility of Galvanized Castings of "Flecto" Iron and Untreated Malleable Iron

tion for castings. However, this process causes a considerable portion of malleable castings so treated to become brittle and it was to obviate this disadvantage that the company carried on its researches which resulted in the production of "Flecto" iron. While the announcement is made at this time it is stated that all malleable iron castings produced by this company during the past two years have been treated by this process, the announcement having been withheld until thorough tests in the field could corroborate the results of tests at the factory.

A Frog with a Bevel Point

EXPERIENCE in the repair of frogs for a large passenger terminal led to the development of novel modifications from conventional designs which were given an extensive test in this same terminal and as the result of the service rendered by this experimental frog, the new design has now been put on the market by the Bevel Point Frog Company of St. Paul, Minn., under the name "Deandy" frog. The characteristics of this frog, which will be readily understood from the sketch, are the result of efforts to develop a frog having greater strength at the point. This has been accomplished in three ways. The sides of the point have been beveled, the filler blocks have been modified

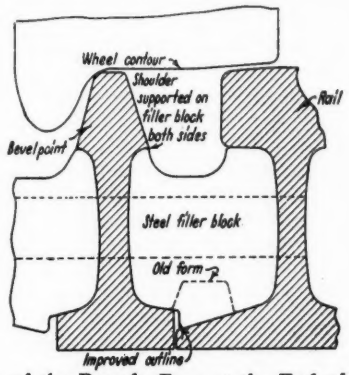


A Test Frog of the Bevel Point Design After Three Years and Two Months' Service

so as to give more support to the point and the point is heat treated for the full length of the taper.

The effect of the changes in the point and the fillers is to give the point a sturdier section as well as to provide shoulders at the very end of the point so that it may be supported effectively by the filler blocks. In addition the bottoms of the filler blocks, instead of being recessed like the top, are shaped to give a bearing over practically the entire flange of the wing rails, thus increasing the support for the filler blocks in carrying the load applied by the frog point.

The photograph is a view of a test frog of this design after it had been in service in the yards of the St. Paul Union Depot Company for three years and two months. It is estimtaed that approximately 3000 wheels passed over this frog daily during the time that it was in service. As seen in the illustration, the point shows almost no wear; in fact, the tool marks are still visible on the beveled sides of the point, while the straight edge shows that considerable wear has taken place back of the point and that the wing rail on the far side has also worn considerably. This wear is the result of heat treating only the extreme end of the point, the battering taking place just beyond the



A Section of the Deandy Frog at the End of the Point

end of the heat treated portion. This difficulty has now been overcome by extending the heat treatment further back. It is said that other frogs built according to this design with heat treatment of the point extending to the end of the taper are rendering excellent service.

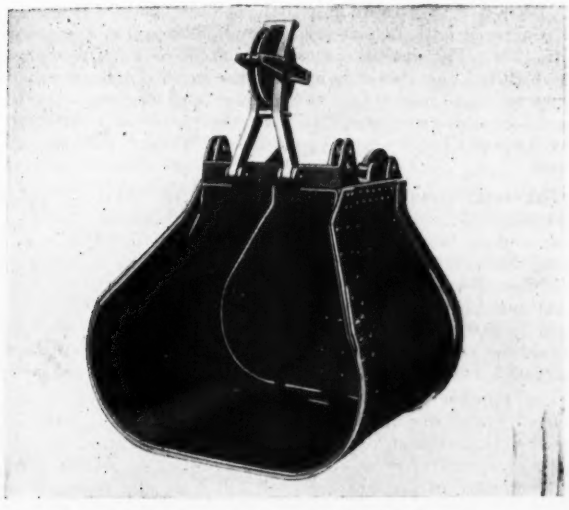
Two New Attachments For American Ditcher

IN THE LAST few years the cleaning of ballast has become a matter of unusual importance to maintenance of way officers and since the handling of this material is costly, particularly on busy lines, much thought has been devoted to new methods of handling which will make the work less expensive. Cranes and ditchers equipped with special clam shell buckets designed to dig ballast at the ends of ties, have been

The Dipper Set at an Angle Digs in Close to the Ends of the Ties

used quite extensively and with good results as compared to hand methods. Clam shell buckets have the disadvantage, however, that they must be spotted for each bite, and where the ballast is loosely packed they penetrate deeper than in the harder portions, leaving a ditch of irregular depth. To overcome this difficulty the American Hoist & Derrick Co., St. Paul, Minn., has recently designed and built a special dipper stick for use in connection with "American" railroad ditchers. The dipper is set at an angle, permitting it to dig in close to the ends of the ties and the hinged dipper arm permits uniformity of depth to be obtained.

An "American" railroad ditcher with the special ballast dipper has been used successfully on a prominent eastern road, the ditcher being mounted on a flat car between two air dump cars with a caboose and work locomotive coupled at one end. The regular working day is eight hours and allowing for the time lost in



Two-Yard Scoop Designed for Handling Snow

clearing for trains, taking on water and running to and from the work, the actual working time on the line is reduced to about four hours.

The ballast shovel is always operated over the right side of the flat car on which it works and on double track work the ditcher removes ballast from the space between the ties to a depth of approximately 20 in. When the distance between the ends of the ties is as much as 5 ft. 6 in., a 30-cu. yd. dump car well filled represents 75 track ft. of ballast dug from between the ties. With one car filled, the ditcher turns through 180 deg. and operates over the other side of the flat car, facing the second dump car. In the four hours actual working time, the operator can remove and waste eighteen 30-cu. yd. cars. In making this record the dipper makes 3½ to 4 passes a minute.

In addition to the train crew the ditcher engineer, firemen, and two or three ground men, are ordinarily used. As the crew becomes more proficient the yardages mentioned can probably be increased.

The American Hoist & Derrick Co. has also brought out another new attachment for the ditcher which is an over-size dipper of two yards capacity designed for handling snow. This dipper is similar in construction and operation to the ditching dipper with which it is readily interchangeable. It s, however, much lighter in proportion to its size, weighing only 3,000 lb. Instead of the teeth used on the ditching dipper, a sharp cutting edge is employed.

The Material Market

AN EXAMINATION of the tables of iron and steel and scrap prices given below will show that the quotations for March are almost exactly the same as those for February with respect to all items. In the face of present indications, also, there is reason to believe that no marked transitions will occur during the coming month.

Production has remained at a high level during the last 30 days ranging from 85 to 95 per cent. of capacity. Demand has also continued on an active scale, although the awards of structural steel contracts, which were in large volume early in the month, were curtailed somewhat during the last two weeks. The distinctive feature of the demand is that it consists in large part in orders for materials for immediate use, rather than for the replenishment of stocks. The rate of production also is predicated on current orders and the prospect of continued demand, rather than on any back log of orders on the books.

PRICES PER 100 LB.

	Pittsburgh	Chicago	Pittsburgh	Chicago
	February		March	
Track spikes	$2.80 to $3.10	$2.90 to $3.00	$2.90 to $3.10	$2.90 to $3.00
Track bolts	4.00 to 4.25	3.90 to 4.00	..... 4.25	3.90 to 4.00
Angle bars	..... 2.75	..... 2.75	..... 2.75	..... 2.75
Tie plates, steel	..... 2.25	..... 2.25	2.25 to 2.35	..... 2.25
Boat spikes	..... 3.25	....	..... 3.25	..... 3.25
Plain wire	..... 2.50	..... 2.55	..... 2.50	..... 2.55
Wire nails, keg	..... 2.65	..... 2.70	..... 2.65	..... 2.70
Barb wire, galv.	..... 3.35	..... 3.40	..... 3.35	..... 3.40
C. I. pipe, 6 in. to 12 in., ton	....	49.20 to 50.20	....	49.20 to 50.20
Plates	1.80 to 1.90	..... 2.10	1.85 to 1.90	..... 2.10
Shapes	1.90 to 2.00	..... 2.10	1.90 to 2.00	..... 2.10
Bars, soft steel	..... 2.00	..... 2.10	2.00 to 2.10	..... 2.10
Rivets, struct.	2.50 to 2.60	..... 2.75	2.50 to 2.60	..... 2.75
Conc. bars, billet	..... 2.00	....	2.00 to 2.10	....
Conc. bars, rail	1.80 to 1.90	..... 2.00	1.80 to 1.90	..... 2.00
Rail, per gross ton, f. o. b. mills	....	43.00	....	43.00

The scrap market is relatively quiet and prices are being maintained at substantially the basis quoted last month.

PRICES PER GROSS TON AT CHICAGO

	February	March
Relaying rails	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	16.50 to 17.00	16.50 to 17.00
Rails less than 3 ft. long	17.50 to 18.00	17.50 to 18.00
Frogs and switches cut apart	15.50 to 16.00	15.25 to 15.75
Steel angle bars	18.00 to 18.50	16.50 to 17.00

The lumber market is quiet in nearly all sections of the country, with the exception of a few of the large cities in the north, notably New York. Dealers are inclined to explain this situation by the exceedingly late spring, yard buying being exceptionally slow, so that railway purchases comprise an important factor in the current demand. As a consequence the prices are generally the same or somewhat lower than last month.

SOUTHERN PINE MILL PRICES

	February	March
Flooring, 1x4, B and B flat	$49.93	$48.71
Boards, 1x8, No. 1	35.42	37.80
Dimension, 2x4, 16, No. 1 common	28.45	28.46
Dimension, 2x10, No. 1, common	22.90	30.96
Timbers, 4x4 to 8x8, No. 1	32.70	29.50
Timbers, 3x12 to 12x12, rough	46.29	42.46

DOUGLAS FIR MILL PRICES

	February	March
Flooring, 1x4, No. 2, clear flat	$27.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	15.00	15.00
Dimension, 2x4, No. 1, common	17.00	17.00
Dimension, 2x10, 16, No. 1, common	16.50	16.50
Timbers, 6x6 to 8x8, No. 1	21.00	21.00
Timbers, 3x12 to 12x12, rough	16.00	16.00

Prices for Portland cement in carload lots, not including package, are the same as quoted in last month's issue.

New York	$2.15	Minneapolis	2.32
Pittsburgh	2.09	Dallas	2.05
New Orleans	2.40	Denver	2.84
Chicago	2.10	San Francisco	2.31
Cincinnati	2.37	Montreal	1.80

Railroad News Briefly Told

The locomotive shops of the New York, Chicago & St. Louis at Frankfort, Ind., suffered extensive damage by fire on March 9. The estimated loss, including damage to locomotives was $500,000 or more.

Ben W. Hooper, chairman of the United States Railroad Labor Board, who has been in ill health for some time, will retire upon the expiration of his term on April 15. No action toward the election of his successor as chairman or the appointment of members to replace two other members whose terms expire at the same time as that of Chairman Hooper is expected to be taken pending the action of Congress on railroad labor legislation now pending.

The Water Service Department of the Illinois Central includes two men who succeeded their fathers as water service foremen after the fathers retired after long periods of service. Hubert Landgraf recently succeeded his father, Charles Landgraf, who had been in the employ of the Illinois Central for 37 years. In 1924 Emmett Brannan succeeded his father, Henry Brannan, who had been employed on the Illinois Central for 47 years.

Revenue freight traffic handled by the Class 1 railroads in 1925, excluding switching and terminal companies, amounted to 414,139,835,000 ton-miles as compared with 388,865,683,000 ton-miles in 1924 and 412,727,228,422 in 1923, thus breaking all records of ton-miles in a single year, just as the weekly figures for revenue freight car loadings broke all previous records.

Officers and members of the train and engine service brotherhoods have organized the American Home Builders, Inc., with headquarters at Cleveland, Ohio., through which it is planned to help railway employees to finance the construction of homes. Although the stockholders and officers of the new company are brotherhood members and officers, the brotherhoods are not directly connected with the new organization.

A protest against the Canadian National going to Minnesota to purchase cedar ties for the Hudson Bay Railway was made in the House of Commons at Ottawa last week by W. W. Kennedy, a Conservative member from Winnipeg. This member had asked the railway about such purchase and he read to the House a letter from R. C. Vaughan, vice-president in charge of purchases, in which it was pointed out that only about 50,000 were so purchased and all from points on the C. N. R. "That is just 50,000 ties too many from the state of Minnesota," said Mr. Kennedy.

Locomotives on Class 1 railroads consumed a total of 97,477,842 tons of coal in 1925, a decrease of 439,771 tons as compared with the consumption in 1924. The consumption of fuel oil by locomotives in 1924 was 2,084,219,402 gal., or a decrease of 14,844,617 gal., as compared with the preceding year. Expressed in terms of traffic produced, the consumption of fuel by the railroads in 1925 represents an average of 159 lb. per thousand tons of freight and equipment hauled one mile, excluding the weight of the locomotive and tender. This represents a decrease of 11 lb. under the average for 1924 and 44 lb. less than that for 1923, and is the lowest average ever attained by the railroads since the compilation of these reports began in 1920.

More than 500,000,000 lb. of commercial explosives were handled by the railroads of the United States and Canada during 1925 without the death or injury of any person, according to a report issued by the Bureau of Explosives of the American Railway Association. This movement of explosives required the use of approximately 375,000 cars. This record is due to the excellent work of thousands of factory and railway employees.

Revenue freight car loadings in the week ended March 6, greatly exceeded the figures for the corresponding weeks of previous years, totaling 964,681, an increase of 32,637 cars as compared with last year and of 35,300 cars as compared with 1924. This was the second consecutive week this year in which the cumulative figures for the year to date exceeded those of last year. The cumulative total for the first 10 weeks of this year was 9,073,140 compared with 9,012,040 and 8,855,470 for the same periods in 1925 and 1924 respectively.

The total compensation of employes of Class I roads, including 18 switching and terminal companies, for the year ending December 31, 1925, was $2,900,107,384, as compared with $2,867,564,802 in 1924, according to a compilation issued by the Interstate Commerce Commission. The total number of employes on these roads for 1925 averaged 1,769,099, a decrease of 8,292 or 0.5 per cent from the preceding year. The average annual earnings per employe increased from $1,613 in 1924 to $1,639 in 1925, or 1.6 per cent.

The number of persons killed on the highways of the United States during the twelve months of 1925 is reported by the Department of Commerce, at Washington, on the basis of estimates received from many cities, as 24,000. The total number of persons reported killed on the railroads of the country in the same time (December estimated) was 6,705. Included in the total of casualties on the railroads are about 2,000 persons killed at grade crossings, all, or nearly all, without fault on the part of the railroad. Most of these 2,000 fatalities are, no doubt, included in the government's total of 24,000.

In January, 1926, the earnings of the Class 1 railroads were at the annual rate of 4.6 per cent on their property investment, according to a compilation made by the Bureau of Railway Economics. The operating revenue in January amounted to $480,997,458, as compared with $485,018,679 in January, 1925, the operating expenses totaled $378,648,714, as compared with $383,961,979 for the same month a year ago, while the net railway operating income for the month was $65,724,560, as compared with $66,060,177 for the corresponding period last year. Maintenance of way expenditures amounted to $58,783,090, an increase of $1,815,600 or 3.2 per cent as compared with the same month last year.

Testimony that the adoption by law of the metric system to the exclusion of the present system of weights and measures would cost the railways of the United States an additional investment of $322,835,000, and an additional annual maintenance cost of $60,000,000, as well as $19,970,000 interest annually on the additional investment, or a total annual cost of $79,970,000 was offered by John R. Leighty, special engineer of the Southern, appearing as a representative of the American Railway Association, at a hearing before the House committee on coinage, weights and measures on March 4, on the Britten bill to establish the metric system by January 1, 1935, with certain exceptions. Others offering testimony against the bill were Alfred P. Thom, Jr., general solicitor of the Association of Railway Executives, J. V. Neubert, engineer maintenance of way of the New York Central and W. P. Wiltsee, chief engineer of the Norfolk & Western.

Labor News

Section Foremen Claim Overtime Allowance for Making Time and Material Reports.

A complaint filed before the United States Railroad Labor Board by the Brotherhood of Maintenance of Way Employees involved the claims of 44 section foremen on the Norwalk and Sandusky division of the New York Central (Lines West of Buffalo) for a daily allowance of one hour to compensate them for the time consumed in answering correspondence, making payrolls, time and material reports and other reports and records after the conclusion of their regular work.

The foremen based their claim on the following rule which appears in the agreement between the parties to the dispute: "Monthly rated foremen—Foremen other than track and roadway foremen will be continued on monthly rates to cover all services rendered." They contended that under the provisions of this rule they were entitled to pay for the work above outlined, if and when performed after their regular working hours, and that while the period of one hour was an arbitrary figure the average time spent in correspondence and reports was considerably in excess of one hour per day. They further contended that the track and roadway foremen should be compensated on the same basis as the men they supervise and that they should not be denied pay for the period when they were engaged in the service of the company.

The carrier took the position that the making of reports and the handling of necessary correspondence has always been considered a part of the supervisory duties of section foremen and was so considered in the fixing of monthly rates for foremen. The carrier cited Section H, Article V of the so-called national agreement promulgated by the United States Railroad Administration which provided, in part, as follows: ".....will be compensated on a monthly rate to cover all service rendered, except that when such employees are required to perform work which is not a part of their responsibilities or supervisory duties....."

In its decision, the board denied the claim of the employees. —Decision No. 4034.

Punitive Rate Claimed When Working on Sundays and Holidays to Make up Time Lost

The Brotherhood of Maintenance of Way Employees on the New York Central (Lines West of Buffalo) filed a complaint before the United States Railroad Labor Board, claiming that when men are permitted to make week-end trips to their homes and subsequently work on Sundays or holidays to make up for the time thus lost, they should be compensated at the punitive overtime rate for such service.

The dispute arose over the application of rule 32 of the agreement which reads as follows: "Employees will be allowed, when in the judgment of the management conditions permit, to make week-end trips to their homes. Free transportation will be furnished consistent with the regulations. Any time lost on this account will not be paid for. Time not worked on this account may be worked by agreement between the management and the employees, outside of the regular hours on other days at pro-rata time for hours so worked."

The employees based their contention for the punitive rate for Sunday and holiday service in making up this lost time on the language of Decision No. 2687 of Labor Board which stipulated the punitive rate for work on Sundays and holidays. The carrier contended that the language of the rule quoted should not be so interpreted as to penalize it for accomodating the employees, who in the past had definitely expressed the wish to secure a full week's work of 48 hours. The carrier stated that it had never forced the men to work on Sundays and holidays against their will and that had it done so it would have felt obligated to pay the punitive rate.

Basing its decision on the language of rule 32 above quoted, the Labor Board denied the claim of the employees.—Decision No. 4035.

Personal Mention

General

George Stephenson has been appointed superintendent of the Port Reading creosoting plant of the Central Railroad of New Jersey-Reading Company, at Port Reading, N. J., succeeding **C. Marshall Taylor,** who has resigned to become general manager of the Sharples Solvent Corp., Charleston, W. Va. Mr. Taylor was born on February 8, 1884, at Edgemont, Pa. He graduated from Swarthmore College in 1904, and was instructor in chemistry at that school in 1904 and 1905. During 1905 and 1906 he served as chemist for the Charles E. Hires Company, in the latter year becoming associated with the International Creosoting & Construction Company at Texarkana, Tex. He left this company in 1910 to become superintendent of the Port Reading Creosoting plant of the Reading Company and the Central Railroad of New Jersey, which position he was holding at the time of his resignation, as noted above. Mr. Taylor has been an active member of the American Wood Preservers' Association, of which he was president in 1921. He has been a member of the Committee on Wood Preservation of the American Railway Engineering Association for a number of years and has served as its chairman.

C. Marshall Taylor

Herbert B. Hoyt, whose promotion to superintendent of the timber preserving plant of the Buffalo, Rochester & Pittsburgh, with headquarters at Bradford, Pa., was reported in the February issue, was born at Wellsville, N. Y., on January 26, 1887, and graduated in civil engineering from Cornell University in 1909. He entered railway service in 1909 as a chainman on the New York Central, holding various positions in various locations in the track and engineering branches of the maintenance of way department. He left the New York Central in 1916 to become assistant superintendent of the timber preserving plant of the Buffalo, Rochester & Pittsburgh, later being promoted to superintendent. He left railroad service in 1921 to engage in engineering work in Colorado, returning to the New York Central in 1922 where he served in the bridge and building and track departments. He returned to the Buffalo, Rochester & Pittsburgh in 1924, where he was employed in the track department until the time of his promotion to superintendent of the timber preserving plant at Bradford, Pa.

Herbert B. Hoyt

B. L. Butler has been appointed water and fuel supervisor of the Shasta division of the Southern Pacific, with head-

quarters at Dunsmuir, Cal., succeeding **J. B. Duncan**, resigned. Mr. Butler was born on March 3, 1883, at Yuka, Cal. Following several years in mining work and in the construction of mills in California and Arizona, he entered railway service on April 10, 1919, as a carpenter on the Southern Pacific, being promoted to bridge and building foreman in 1920. His work since that time has been primarily in bridge construction, until the time of his appointment to water and fuel supervisor, as noted above.

Elijah Rinehart, district bridge inspector on the Baltimore district, Baltimore & Ohio, has been promoted to system inspector of tunnels, with headquarters at Baltimore.

Engineering

W. G. Tinney has been appointed engineer maintenance of way of the Denver & Salt Lake, with jurisdiction over all maintenance of way matters.

W. H. Evans, assistant on the engineering corps, Monongahela division, Pennsylvania System, Central region, has been promoted to assistant to the division engineer, with headquarters at Uniontown, Pa.

J. E. Davison, assistant to the chief engineer of the Canadian National, with headquarters at Winnipeg, Manitoba, has been appointed district engineer of the Manitoba district, with the same headquarters, to succeed **A. V. Redmond**, deceased.

H. J. Armstrong, general superintendent of transportation and maintenance of way of the Missouri & North Arkansas, with headquarters at Harrison, Ark., has been promoted to chief engineer, with the same headquarters, a newly created position.

G. W. Shoemaker, whose promotion to division engineer on the Seaboard Air Line, with headquarters at Tampa, Fla., was reported in the March issue, was born on January 23, 1900 at Elmira, N. Y., and graduated from Georgia Institute of Technology in 1922. He entered railway service on June 15, 1922, as an engineer inspector on the Seaboard Air Line, and was promoted to assistant to the division engineer on February 14, 1923. On July 1, 1925, he was promoted to assistant division engineer, and was holding that position at the time of his promotion to division engineer, with headquarters at Tampa, Fla.

Edward L. Cannon, whose promotion to division engineer of the Alabama division of the Seaboard Air Line, with headquarters at Savannah, Ga., was reported in the March issue, was born on March 4, 1880, at Norfolk, Va. He graduated in civil engineering from the Virginia Military Institute at Lexington, Va., in 1901, and entered railway service as a supervisor of roadway and tracks on the Norfolk-Southern in 1903. He held this position for two years, when he left that road to become chief clerk to the chief engineer on the Seaboard Air Line, being promoted to office engineer to the chief engineer on December 10, 1916. From March 1, 1921, until 1922, he held the position of land appraiser in the valuation department, in the latter year being made assistant division engineer. He was holding this position at the time of his promotion to division engineer at Savannah, as noted above.

William J. Backes, whose appointment to engineer in charge of maintenance of way of the Boston & Maine was reported in the February issue, was born on April 29, 1879, at Hartford, Conn., and graduated from Sheffield Scientific School in 1899 with the degree of B. S., receiving the degree of C. E. from the Pennsylvania Military College in 1919. He entered railway service in July, 1899, and from that date until September, 1900, served as a rodman and leveler on the Mexican International railroad. From September, 1900, to December of the same year he was assistant foreman for the American Dry-Kiln Company, returning to railroad service in February, 1901, as an assistant in the engineering corps of the Pennsylvania, lines west of Pittsburgh. From July, 1902, to July, 1903, he served as a transitman, leaving the Pennsylvania in the latter year to become transitman for the New York, New Haven & Hartford. He was appointed assistant engineer on the New York, Pennsylvania & New Jersey in April, 1905, and in May, 1906, was appointed chief engineer of the Central New England. On March 1, 1913, he was promoted to engineer maintenance of way of the same road, and the New York, New Haven & Hartford, in November, 1923, being promoted to assistant general manager. He held this position until his resignation in June, 1925, being later appointed engineer in charge of maintenance of way of the Boston & Maine, as noted above.

Willis H. Lowther, whose appointment as division engineer of the Union Pacific, at Cheyenne, Wyo., was reported in the February issue, was born on November 23, 1886, at Colorado Springs, Colo. and graduated from the College of Engineering of the Colorado University in 1909. He entered railway service on September 1, 1911, on the Oregon Short line unit of the Union Pacific, and from December, 1911, to March 1912, served as a levelman on location. In the latter year he was made instrumentman on construction, holding this position until November of that year when he became office engineer of the Oregon-Washington unit of the system. From May, 1913, until January, 1915, he served as division engineer, returning to the Oregon Short Line as assistant engineer, maintenance, in the latter year. In January, 1917, he was appointed engineer accountant and assistant to the engineer maintenance of way, and in August, 1917, was promoted to division engineer, maintenance, of the Idaho division. He was transferred to the Central division in September, 1919, and to the Colorado division in October, 1920. He left railway service to become engineer of flood control for the city of Denver in March, 1925, returning to the Union Pacific in January 1926, as division engineer of the Wyoming division, with headquarters at Cheyenne, Wyo.

Willis H. Lowther

O. F. McNairy, whose promotion to district engineer maintenance of way of the Central District Seaboard Air Line, with headquarters at Jacksonville, Fla., was announced in the March issue, was born on August 6, 1884. He graduated from North Carolina State College in 1907 and entered the employ of the Seaboard Air Line in May of that year as an inspector. Following a year in that position and another year as bridge foreman and superintendent of construction of highway bridges, he was again appointed inspector in 1909, and from that time until 1918 he was employed consecutively as resident engineer and assistant engineer. He entered the Army in 1918 receiving a commission of first lieutenant of engineers and returning to the Seaboard Air Line in 1919 in the capacity of real estate agent in the corporate organization. In 1920 he was appointed assistant division engineer with headquarters at Hamlet, N. C., being promoted to division engineer soon afterward. He continued in this position, with headquarters first at Jacksonville, Fla., and later at Hamlet, being located at Hamlet at the time of his recent advancement.

Track

T. O. Moe, roadmaster on the Chicago & North Western at South Pekin, Ill., has had his headquarters transferred to Manlius, Ill.

Thomas Duggan has been appointed roadmaster of the Bowie district of the Rio Grande division of the Southern Pacific, with headquarters at Bowie, Ariz., succeeding **E. Belch**, assigned to other duties.

G. W. Preston, roadmaster of the Sandusky division, Lake Erie & Western district, of the New York, Chicago & St. Louis, with headquarters at Lima, Ohio, has been appointed

supervisor of track of the Cleveland division, Nickel Plate district, with headquarters at Cleveland, Ohio, succeeding **W. J. Connors,** whose death is noted elsewhere. **A. T. Wilkinson** has been appointed roadmaster of the Sandusky division, with headquarters at Lima, succeeding Mr. Preston.

C. I. Jones has been appointed acting roadmaster of the First district of the Arizona division of the Atchison, Topeka & Santa Fe, Coast Lines, with headquarters at Kingman, Ariz., succeeding **R. D. Brown,** who has been granted a leave of absence.

Hiram F. Kretlow, whose promotion to roadmaster on the Union Pacific (Los Angeles & Salt Lake unit), with headquarters at Caliente, Nev., was reported in the February issue, was born on September 2, 1894, at Hamburg, Iowa. He entered railway service in October, 1909, as an extra gang timekeeper on the Union Pacific, and served as timekeeper, laborer, section, extra gang and ballast pit foreman until November, 1922, when he became a yard foreman on the Oregon Short Line, at Pocatello, Idaho. In February, 1923, he was made a section foreman on the Los Angeles & Salt Lake, later serving as extra gang foreman and general foreman, respectively. He was holding the position of foreman of the Caliente yard at the time of his promotion to roadmaster.

Obituary

William L. Rohbock, chief engineer of the Wheeling & Lake Erie and the Lorain & West Virginia, with headquarters at Cleveland, Ohio, died suddenly in that city on March 14. He was born at Pittsburgh, Pa., on June 7, 1873. From 1896 to 1898 he served as a draftsman and engineer for the Westinghouse Electric & Manufacturing Company, entering railroad service in May, 1898, as a transitman for the Philadelphia Company at Pittsburgh, since which time until June, 1906, he was with the Pittsburgh Railway Company. He then entered the service of the Wheeling & Lake Erie as chief draftsman, which position he held until 1908, when he was promoted to assistant engineer. From 1909 until July, 1912, he served as assistant to the chief engineer, in the latter year being promoted to acting chief engineer. In December, 1912, he was promoted to chief engineer, also becoming chief engineer of the Lorain & West Virginia. He was serving in this capacity at the time of his death.

William H. Finley, until recently president and formerly chief engineer of the Chicago & North Western, who resigned in June, 1925, died at his home at Wheaton, Ill., on March 17, from pneumonia. Mr. Finley was taken sick only the day prior to his death, his illness being attributed to exposure at the funeral of H. G. Hetzler, late president of the Chicago & Western Indiana, on March 15. Since his resignation as president of the North Western, Mr. Finley has practiced as a consulting engineer at Chicago. He has been particularly active in technical societies, being a member of the American Society of Civil Engineers, the Franklin Institute, the American Association of Engineers and the Western Society of Engineers, having been a past president of the last two. Mr. Finley was born on January 22, 1862, in New Castle county, Del., and was educated in the public schools and by private instruction. He entered railway service in October, 1887, as a draftsman on the Chicago, Milwaukee & St. Paul. Four years later he was promoted to assistant engineer and placed in charge of designing in the bridge and building department. Mr. Finley entered the service of the Chicago & North Western in 1892, as engineer of bridges, which position he held for 10 years. In 1902 he was promoted to principal assistant engineer and four years later to assistant chief engineer. He was promoted to chief engineer in 1913 and was elected president of the corporation in 1918, assuming the active presidency of the property at the termination of federal control.

William H. Finley

H. G. Hetzler, president of the Chicago & Western Indiana and the Belt Railway of Chicago and an engineer by training and experience, died at his home in Chicago on March 13, after an illness of three months. Mr. Hetzler was stricken with paralysis last December. He was born in 1862 and graduated from the University of Michigan in 1886. He entered railway service in that year as assistant engineer on the Chicago, Burlington & Quincy, and in 1891 was appointed engineer maintenance of way of the Louisville, New Albany & Chicago. Mr. Hetzler returned to the Burlington in 1892 as roadmaster at Chicago, and held that position until 1898, when he was promoted to superintendent of freight terminals, with the same headquarters. In 1903 he was promoted to superintendent of the Chicago division, resigning in May, 1905, when he was elected president of the Metropolitan West Side Elevated Railroad in Chicago. Mr. Hetzler was elected president of the Chicago & Western Indiana and the Belt Railway of Chicago in February, 1910, which position he held until his death, with the exception of the period of federal control when he was successively general manager and federal manager of the same roads. Mr. Hetzler was active in the affairs of the Young Men's Christian Association, being a director of the Chicago association at the time of his death, and a former treasurer.

H. G. Hetzler

Willis J. Connors, track supervisor of the Cleveland division, Nickel Plate district, of the New York, Chicago & St. Louis, died on February 20, due to injuries received in an automobile accident. Mr. Connors was born in Bellevue, Ohio, on November 28, 1897, and entered railway service as a clerk in the supervisor's office of the Nickel Plate at Bellevue, on May 23, 1917. He was transferred to Buffalo Junction on August 1, 1919, and was promoted to chief clerk to the superintendent of track, maintenance and construction at Cleveland, on April 1, 1920. He was promoted to chief clerk to the assistant chief engineer, with headquarters at Cleveland, Ohio, on September 16, 1924, and to track supervisor of the Cleveland division on December 8, 1924.

Miles Cary Selden, superintendent of the Richmond division of the Chesapeake & Ohio, died recently following a brief illness. He was born at Snowden, Va., on September 15, 1874, and graduated from Virginia Military Institute. He entered the service of the Chesapeake & Ohio as assistant foreman at Newport News in April, 1902; was promoted to levelman, in the construction department, January, 1905; to resident engineer, Peninsular district, March, 1906; to division engineer, maintenance-of-way, Newport News and Norfolk terminal division, June 1, 1910; to supervisor of track, Rivanna district, May, 1912; to division engineer, Richmond division, September, 1914; to trainmaster, Rivanna district November, 1916; to assistant superintendent, Newport News and Norfolk Terminal division, November, 1917; to acting superintendent, Clifton Forge division, October, 1919; to superintendent, Newport News and Norfolk Terminal division, November 15, 1919; to superintendent, Richmond division, February 1, 1923, in which latter position he was serving at the time of his death.

Construction News

The Atchison, Topeka & Santa Fe has awarded a contract to Sharp & Fellows, Los Angeles, Cal., for the construction of an extension from Pawhuska, Okla., to Fairfax, a distance of 32 miles. This extension in connection with the branch line from Owen to Pawhuska will constitute a cut-off connecting the Southern Kansas division with the Eastern Oklahoma division, which will shorten the distance from Kansas City, Mo., to Oklahoma and Texas points about 61 miles.

The Santa Fe and city of Ponca City, Okla., are preparing plans for the construction of a viaduct over the railway tracks at Grand avenue in Ponca City to cost $160,000. This company has applied to the Interstate Commerce Commission for authority for the construction of a line of 30 miles from a connection with the Panhandle & Santa Fe, near Panhandle, Tex., to the oil fields in Hutchinson county, Tex. This company will construct a freight station 24 ft. by 80 ft. at Huntington Park, Los Angeles. An additional shop, a freight yard and track facilities, including concrete drives and water mains, will be constructed at San Bernardino, Cal., at an estimated cost of $500,000.

The Baltimore & Ohio has awarded a contract to the Roberts & Schaefer Company for an automatic electric coaling hoist at Morgantown and Kingwood Junction, W. Va.,

The Boston & Albany has awarded a contract to Charles S. Clark, Boston, Mass., for special track material for the new station under construction at Springfield, Mass.

The Boston & Maine is preparing for the construction of a gravity classification yard near Lowell Junction, Mass., to have a capacity of 2,500 cars.

The Camas Prairie has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from Joseph to Stites, Idaho, 66 miles, proposing to operate also over a line to be built by the Northern Pacific from Joseph to Orofino, 32 miles.

The Canadian National will soon receive bids for the construction of a 44-mile branch line in the vicinity of Turtleford, Sask., which is estimated to cost $1,571,000. It is also expected that bids will be taken shortly for the construction of the Dunblane, Sask.-Central Butte branch, estimated to cost $1,000,000.

The Central of Vermont has awarded a contract to the Roberts & Schaefer Company, Chicago, for the erection of an electrically operated cinder plant at New London, Conn.

The Chicago & North Western has placed a contract with the Roberts & Schaefer Company for the rehabilitation of its coal-handling equipment at Adams, Wis. Bids have been received for the construction of a one-story brick freight station, 32 ft. by 256 ft., at Iron Mountain, Mich.

The Chicago, Burlington & Quincy is preparing plans for the rearrangement of tracks and the construction of an addition to the roundhouse at Gibson, Neb., to cost $40,000.

The Chicago, Milwaukee & St. Paul is preparing plans for the construction of a steel and concrete bridge over the Mississippi river from Minneapolis, Minn., to the vicinity of the Ford Motor Company factory at St. Paul. The structure is expected to cost approximately $1,500,000. A contract has been awarded to the Woods Brothers Construction Company, Lincoln, Neb., for the placement of current retards for bank protection in the Missouri river, just north of the railway bridge at Chamberlain, S. D., to cost $50,000.

The Chicago, North Shore & Milwaukee has awarded a contract to the Libertyville Construction Company, Libertyville, Ill., for the construction of a one-story passenger station 34 ft. by 96 ft., at Mundelein, Ill., to cost $50,000.

The Chicago, Rock Island & Pacific has awarded a contract for the construction of a 300-ton capacity coaling station at Enid, Okla., to the Railroad Water & Coal Handling Company, Chicago; a 400-ton capacity coaling station at Washington, Ia., to the Howlett Construction Company., and 400-ton capacity coaling stations at West Liberty, Ia., and Topeka, Kan., to Fairbanks Morse & Co. Plans have been prepared for the construction of coaling stations at Marengo, Ia., and Council Bluffs. A contract has been awarded to Fairbanks, Morse & Co., for the construction of a coaling station at Eldon, Ia. The construction of a new station and eating house at Tucumcari, N. M., to cost $69,000, and of a warehouse at Kansas City, Mo., to cost $55,000, is contemplated. This company has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from a point near Trenton, Mo., to a connection with the Chicago, Milwaukee & St. Paul near Braymer, Mo., 33.65 miles.

The Cleveland, Cincinnati, Chicago & St. Louis awarded a contract to H. A. Glaser, of Muncie, Ind., for the construction of an engine terminal at Kankakee, Ill., to cost $264,000, reported in the March issue.

The Delaware, Lackawanna & Western will build a modern concrete coaling station at East Buffalo, N. Y., with a capacity of 1,000 tons of coal, and sand storage house for locomotive sand, with a capacity of 1,000 tons of wet sand, all to be in one structure—a combined sand and coaling station. This company will also build a new turntable 105 ft. long, at East Buffalo, N. Y.

The Erie is receiving bids for the elimination of a grade crossing at Piaget avenue, Clifton, N. J. The first section of the grade crossing elimination program at Paterson, N. J., is nearing completion and contracts will probably be awarded covering the second section during the current month.

The Great Northern will construct a gravel-washing plant at Reiter, Wash., which will cost approximately $150,000. A contract has been awarded to F. J. Siverson, Minneapolis, Minn., for the construction of a one-story brick and concrete addition to a freight house at Minneapolis. The addition will have dimensions of 32 ft. by 125 ft.

The Illinois Central has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a boiler shop, paint and tank shop at Paducah, Ky. A contract has been awarded to the Ellington Miller Company, Chicago, for the construction of an iron shed, brass foundry, storehouse, wash and locker buildings at Paducah.

The Louisville & Nashville is preparing plans for the construction of a shop building at West Paris, Tenn., to replace a structure recently destroyed by fire.

The Maine Central has authorized the construction of a coaling plant, a seven-stall enginehouse, a turntable and a storehouse and the rearrangement of tracks at Lewiston, Me.; estimated cost $113,000. Coaling plants with rearrangements of sidings to cost $56,000 and $81,000 respectively have been authorized for Rumford and Bangor. Bids on the coaling plants only were closed on March 13.

The Midland Valley has awarded a contract to the Roberts & Schaefer Company, Chicago, for the installation of an electric engine coaler for coaling locomotives direct from cars at Wichita, Kan..

The New York, Chicago & St. Louis is preparing plans for the construction of a machine shop and blacksmith shop at Frankfort, Ind., to replace structures destroyed by fire on March 9 with a loss estimated at $500,000.

The New York, New Haven & Hartford has authorized a seven-stall extension to its enginehouse at Worcester, Mass., to cost approximately $135,000. A contract has been awarded to the Bethlehem Steel Company for the installation of a 100-ft. twin-span turntable at Cedar Hill (New Haven), Conn., at an estimated cost of $22,000.

The Oklahoma & Rich Mountain has been authorized by the Interstate Commerce Commission to construct a line from a connection with the Kansas City Southern at Page, Okla., southwesterly to a connection with the St. Louis-San Francisco at Talihina, approximately 35 miles. The estimated construction cost is $135,750.

The Pennsylvania will construct second track on the St. Louis division west of Terre Haute, Ind., for a total distance of 45 miles, the cost being estimated at $3,500,000. The pro-

ject includes 10.3 miles of second track between Altamont, Ill., and Brownstown, 12.7 miles from Pierron to St. Jacob's, and 22 miles from Casey to Montrose. Contracts have been awarded to A. Guthrie & Co., St. Paul, Minn., for the work from Casey, to Shoyer, and from west of Greenup, to Montrose. A contract has been awarded to the Newhall Company Cleveland, Ohio, for track-laying on the new cut-off from Canton, Ohio to Bayard, at an estimated cost of $700,000.

The Peoria & Pekin Union has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 500-ton three track locomotive coaling and sanding plant at Peoria, Ill., and for the construction of two electric cinder plants adjacent to the coaling station.

The Reading has awarded a contract to George F. Dobbin, Philadelphia, Pa., for the construction of a steel and concrete bridge at Rising Sun avenue and Venango street, Philadelphia, at an estimated cost of $100,000 which will be shared by the municipality.

The San Antonio & Aransas Pass, which petitioned for authority to build an extension from Falfurrias, Tex., to a crossing of the Rio Grande river, about 84 miles, and a line from Edinburg to Harlingen, Tex., 30 miles, has had its petition adversely reported by Commissioner Woodlock of the Interstate Commerce Commission. He recommended a finding by the commission that public convenience and necessity has not been shown.

The Seaboard Air Line has placed a contract with Roberts & Schaefer Company, Chicago, for a 300-ton capacity automatic electric, reinforced concrete, three-track, locomotive coaling and sanding plant at Wildwood, Fla. According to a letter addressed by S. Davies Warfield, president of this road, to stockholders, the company contemplates building new lines, leasing lines and acquiring trackage rights which will give it a westerly connection between its east-west lines and provide a new route between Florida and the North and West. Route mileage to be added in this manner would total 637, of which a considerable portion would be new construction.

The Southern Pacific has awarded a contract to Dwight P. Robinson & Co., New York, for the construction of a freight terminal at Houston, Tex., estimated to cost approximately $1,000,000. The terminal will include a freight depot, freight warehouse, transfer platform and trackage facilities and will cover an area of approximately 30 acres. The headhouse and office building will be of concrete and brick, two stories in height, with dimensions of 202 ft. by 40 ft. The inbound freighthouse will be 1,080 ft. by 45 ft., and the outbound freighthouse, 1,140 ft. by 28 ft. The construction of an enginehouse, with a shop for locomotive repair work is planned in connection with the establishment of a freight and classification yard at Miller's Switch, about six miles from Dallas, Tex. The project is estimated to cost $850,000. Plans are being prepared for the construction of a 240-ft. steel and reinforced concrete bridge over the Rio Grande river at Hidalgo, Tex., to cost $110,000.

The St. Louis-San Francisco has awarded a contract for bridge work at Kansas City, to cost approximately $50,000 to the Virginia Bridge & Iron Company, Roanoke, Va.

The St. Louis Southwestern is planning grade reduction on Gilkerson Hill at Gilkerson, Ark., to cost $103,000 and the construction of a 200-ton coaling station at Malden, Mo., to cost $31,000.

The Texas & Pacific is preparing plans for the construction of a freight warehouse and office building at Dallas, Tex., to cost $1,500,000.

The Union Pacific has been authorized by the Interstate Commerce Commission to construct a branch line south from Yoder, Wyo., 10 miles to serve an irrigation district with a large acreage of sugar beets at an estimated cost not to

The Venice, Englewood & Southern has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from a connection with the Seaboard Air Line at Venice, Fla., to Englewood, Fla., 13 miles, and contemplates extending the line eventually from Englewood to a point on the Charlotte Harbor & Northern, 8 or 10 miles more. Funds for the construction are to be provided by the Seaboard Air Line.

Supply Trade News

General

The Truscon Steel Company, Youngstown, Ohio, is planning the construction of a three-story office building to cost approximately $200,000.

The Industrial Works, Bay City, Mich., has opened a branch office in the Monadnock building, San Francisco, Cal., and has appointed **Harvey L. Livingston** manager of sales for California and Arizona.

The Harnischfeger Corporation, Milwaukee, Wis., has appointed the **William H. Hale Company,** Minneapolis, Minn., its agent in Minnesota. **The Clark-Wilcox Company,** New Haven, Conn., also has been appointed agent to succeed the **K. B. Noble Company.**

The American Hoist & Derrick Company, which has its works and main office at St. Paul, Minn., has opened a branch office at 1943 Railway Exchange building, St. Louis, Mo., with **Ward B. Maurer** in charge. Mr. Maurer, before joining the sales force of the American Hoist & Derrick Company, several years ago, was a member of the engineering staff of the Baltimore & Ohio.

The Bethlehem Chemical Company, Bloomington, Del., has been incorporated for $1,000,000 for the purpose of taking over the plant formerly occupied by the **Artillery Fuse Company,** covering approximately 20 acres, which is to be used by the new corporation for the manufacture of paints and lacquers. The officers of this company are: **Major M. J. Connolly,** president; **H. S. Johnston,** vice-president and treasurer, and **J. M. Smith,** secretary. Machinery has been ordered for the first unit of the plant with a capacity of 60,000 gal. of protective coatings per month.

Personal

W. G. Zahrt, sales manager of the Wayne Tank & Pump Company, Ft. Wayne, Ind., has resigned to enter the life insurance business.

A. H. Lichty, vice-president of the **Colorado Fuel & Iron Company,** in charge of industrial relations, has resigned, effective the latter part of March.

Weir H. Traver has been appointed sales representative of the **Consumers Company,** Chicago, and will specialize in railroad building material sales.

M. H. Gersking, sales representative of the **Carnegie Steel Company,** with headquarters at Columbus, Ohio, has been appointed assistant district sales manager, with headquarters at Cincinnati, Ohio.

E. M. Ivens, formerly representative of the Ingersoll-Rand Company, with headquarters at New Orleans, La., has been appointed special agent of the Chicago Pneumatic Tool Company, with headquarters at Chicago.

H. B. Pflasterer, formerly sales representative of the Hazard Manufacturing Company, with headquarters in Chicago, has been appointed railroad sales engineer of **S. F. Bowser & Co., Inc.,** Ft. Wayne, Ind., with headquarters in Chicago.

Godwin Shenton, formerly assistant to the president and manager of the Coplan Steel Corporation, Ogdensburg, N. Y., is now associated with **The Q. & C. Company** in the mechanical staff with headquarters at 90 West street, New York City.

O. C. Badger, assistant engineer in the office of the system bridge engineer of the Atchison, Topeka & Santa Fe, has resigned to become an engineer in the Railways bureau of the **Portland Cement Association,** with headquarters at Chicago.

James C. Dannaher has been placed in charge of the Pacific coast railway business of the Murphy Varnish Company, Newark, N. J. Mr. Dannaher will have his headquarters at the company's San Francisco, Cal., branch, 555 Mission street.

R. B. Fisher, general sales manager of the Buda Company, Harvey, Ill., has been promoted to vice-president in charge

of the sales and engineering department of the railway division. He entered the employ of the Buda Company in 1910 as assistant engineer, and later was promoted to chief engineer and more recently to sales manager.

James S. Drillette, chief engineer of the **Louisville Frog & Switch Company,** Louisville, Ky., has been promoted to general superintendent. He was born at Beardstown, Ky., on April 2, 1891, and received his education in Louisville with special training in engineering at the University of Wisconsin. He spent six years with the Louisville & Nashville in the coal fields of eastern Kentucky, where he directed the laying of new tracks and yards. He has been connected with the Louisville Frog & Switch Company in various capacities since 1923.

G. L. Moore, engineer maintenance of way of the Lehigh Valley, with headquarters at Bethlehem, Pa., has resigned to become president of the **Arcco Anti Rail Creeping Company,** with temporary headquarters at Owego, N. Y. He was born at Dunkirk, N. Y., on September 21, 1873, and entered railway service on March 5, 1890, as a rodman on the Erie at Hornell, N. Y. In 1898 he was promoted to assistant engineer, which position he held until 1900, when he was appointed supervisor. He held the latter position until 1901, when he was appointed roadmaster and on November 15, of the same year, was appointed division engineer of the Chicago & Alton. On July 1, 1902, he was appointed engineer of maintenance of way, which position he held until April 1, 1904, when he was appointed chief engineer of the Rutland. On February 15, 1909, he resigned to become engineer maintenance of way of the Lehigh Valley, which position he has held until his resignation.

G. L. Moore

C. G. McCaulley, formerly superintendent of signals of the Florida East Coast, has been appointed vice-president of the **E. A. Lundy Company,** Pittsburgh, Pa. He entered railway service as a track laborer on the Pennsylvania on April 7, 1897, and from December, 1899, until April, 1901, held the positions of switch tender, tie inspector and leverman. He resigned from the latter position to accept one in a car shop and resigned on September 1 of the same year to enter the employ of the Union Switch & Signal Company, as a helper on the construction of the Pittsburgh terminal interlockings. Until March 1, 1907, he was employed in the signal department of the Pennsylvania at Pittsburgh, Pa., resigning to become supervisor of signals of the Washington Terminal Company. He was later promoted to supervisor of tracks and signals. He resigned on March 1, 1919, to become engineer of construction in charge of the installation of the Jacksonville terminal interlockings of the Atlantic Coast Line, which position he held until January 1, 1920, when he was appointed assistant superintendent of the Jacksonville Terminal Company. He held the latter position until May 1, 1920, when he was promoted to superintendent, which position he held until February 1, 1925, when he resigned to become superintendent of signals of the Florida East Coast at St. Augustine, Fla., which position he has held until his recent appointment.

C. G. McCaulley

G. W. Hoover district sales manager of the Buda Company with headquarters at St. Louis, Mo., has been promoted to the position of eastern sales manager and export sales manager at 30 Church street, New York City, effective March 24, 1926. **J. E. Murray,** formerly eastern sales manager and eastern export sales manager, and **H. M. Clowson,** assistant eastern sales manager, have resigned.

A. Swartz, formerly receiver and manager of the Toledo & Western, has been appointed vice-president and sales manager of the **Interstate Railway Supply Company,** Cleveland, Ohio. He was born in Columbus, Ohio, in 1878, entered railway service as a rodman on the Ann Arbor in 1897, and in the following year became a topographer and draftsman on the Tennessee Central. He was employed as a draftsman on the New York Central Lines West from 1899 to 1900 and as a draftsman and assistant division engineer on the Baltimore & Ohio from 1901 to 1905. He was then chief draftsman and office engineer on the Erie until 1907, when he was promoted to division engineer, which position he held until 1912. During the following year he was engineer of maintenance of way of the Toledo Railway & Light Company, and in 1913 was appointed vice-president of the Toledo & Western, which position he held until 1916, when he was also appointed manager of railways of the Toledo Railways & Light Company. When the Community Traction Company succeeded the Toledo Railways & Light Company, he was appointed vice-president and manager, which position he held until 1923, when he was appointed receiver and manager of the Toledo & Western. Since September, 1924, he has been located in Chicago representing railway supply companies.

A. Swartz

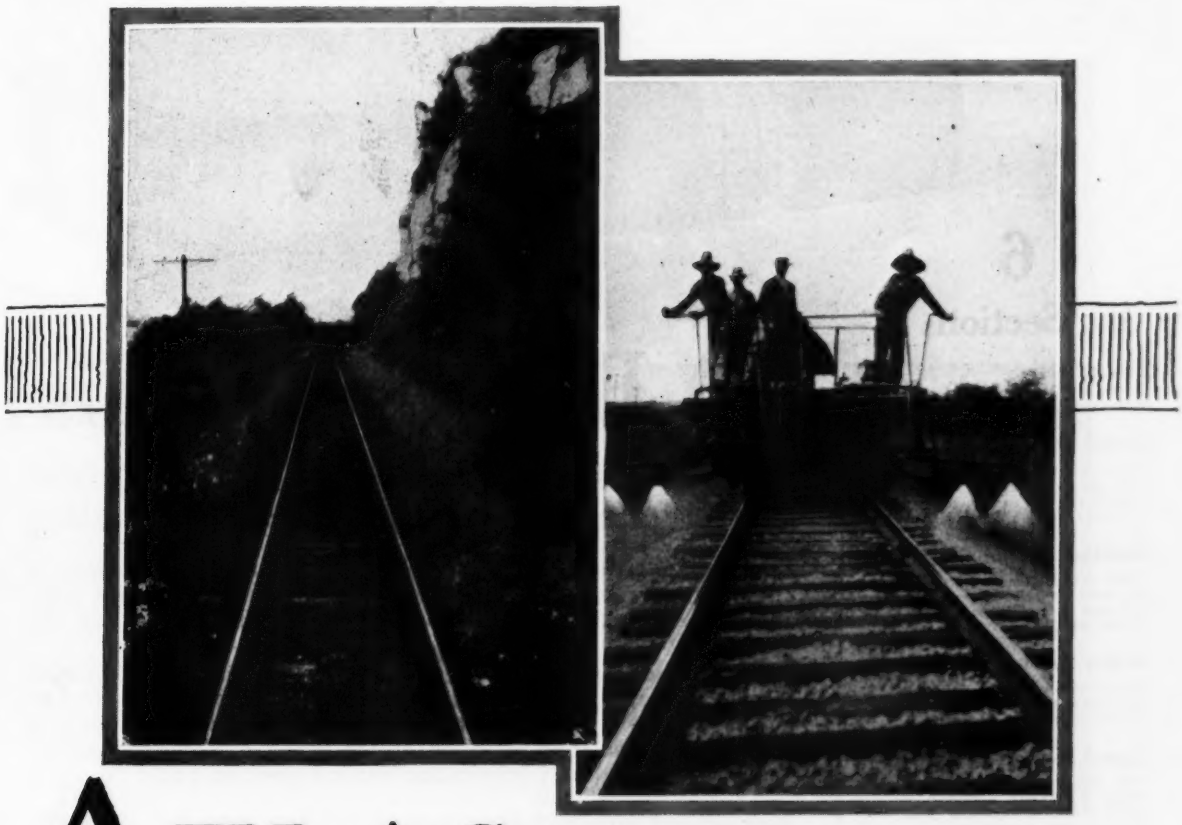
Trade Publications

Standard Section and Heavy Duty Motor Cars.—Mudge & Co., Chicago, has just issued revised specification sheets on both the class WS-2 standard section motor car and the WS-3 heavy duty motor car. In addition to a page of specifications these sheets, which are in folder form, contain large scale illustrations of the cars complete, together with small cuts illustrating various detailed features accompanied by descriptive matter pointing out their advantages.

Air Lifts for Railway Water Supplies.—The Sullivan Machinery Company, Chicago, has issued Bulletin No. 129, which comprises a brief exposition of the air lift as a means of delivering water from deep wells, with particular reference to railway installations and the applicability of Sullivan air lifts and air compressors in this service. The bulletin is illustrated with piping diagrams and photographs of a number of railway air lift water stations.

"Comparison of Diesel Engine Principles."—This is the title of Bulletin No. 1020 recently issued by Fairbanks, Morse & Co., Chicago. The bulletin is a clear, non-technical exposition of the various principles of operation on which Diesel engines have been developed, in which is set forth the reasons why this company has adopted the two-stroke cycle, airless fuel injection principle in its stationary and marine Diesel engines.

Just a word about application method



ATLAS WEEDKILLER SERVICE

has the requisite flexibility to Prevent Waste of Chemical

THE two photographs above are of the same railroad—different divisions. The Spray Car is shown on a track we have treated for three years. This year required only a few gallons of chemical per mile on this track. On the track in the other illustration over 100 gallons per mile were necessary to get proper coverage; track never treated before. Our outfits deliver the goods at uniform speed for any necessary coverage.

CHIPMAN CHEMICAL ENGINEERING COMPANY, Incorporated

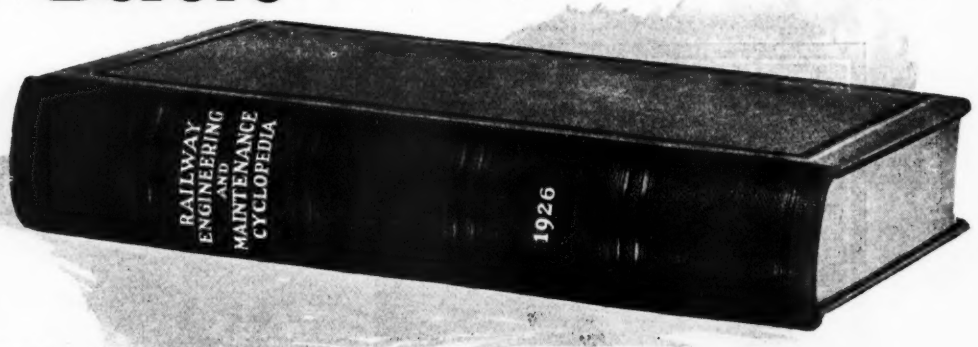
Sole Licensee Under United States Patent No. 1,534,289

Executive Office
BOUND BROOK, NEW JERSEY

Factories

BOUND BROOK, N. J. **PALO ALTO, CAL.** **HOUSTON, TEX.**

Never Before



A Book like This!

An invaluable compilation of facts on railway engineering, maintenance and signaling

From cover to cover the new Railway Engineering and Maintenance Cyclopedia is new and up-to-the-minute—distinctly different from anything ever before published on engineering, maintenance and signaling!

The developments made in recent years in labor saving machinery, devices, practices, etc., are fully covered for the first time in the new cyclopedia. Every phase of engineering, maintenance and signaling work receives detailed attention at the hands of the experts, who gathered this wealth of information into one book for you.

6 Big Sections

Track Section
Covers every phase of the work of track maintenance and repair.

Bridge Section
Covers the construction and repair of all kinds of railroad bridges and the equipment used in bridge work.

Building Section
Every conceivable kind of building used by railroads, its construction and maintenance, described in detail in this section.

Water Service Section
Describes sources of water supply, water treatment and methods of distribution and storage.

Signal Section
The first authoritative treatment of railway signaling in many years. Covers new developments and improved devices and practices.

General Section
Covers Wood Preservation, Timber, Metal, Paint, Cranes, Grab Buckets, Power Units, Rope and Chain, etc.

Important information prepared for you by experts.

Six big sections; namely, track, bridge, building, water service, signaling, and general supply you with hundreds of hard facts that will prove indispensable. Each of these sections would make a fair sized book in itself and covers its subject exhaustively from a practical angle. Months of extensive research by experts whose experience and knowledge of these subjects is widely recognized, together with the co-operation given by committees of the American Railway Engineering Association and of the Signal Section of the American Railway Association, made possible the new improved cyclopedia.

Benefit from the Special Price

If your order is mailed with remittance immediately deduct $3.00 from the regular price of $8.00 for cloth and $10.00 for leather binding. This is in accordance with the special pre-publication offer now in effect. The best way to be sure of this low price is to mail the special price order coupon attached—NOW. Act now while the thought is in your mind. Send the coupon today. This offer expires May 1.

A library in one volume

The new cyclopedia is veritably a library in one volume. It contains over 1,000 pages liberally illustrated by photographs and drawings. If you are called upon to pass upon any device or piece of equipment, or if your duties require that you put it to use, you will recognize in the Cyclopedia an indispensable assistant. You must know! You must act! You must stand behind the action taken! Therefore you need the exhaustive information that only the Cyclopedia can give! Get your copy now—benefit from the Special Pre-publication Price.

Over 1,000 pages
fully illustrated
9x12 inches

This Coupon Saves $3.00

Simmons-Boardman Publishing Company,
Book Department,
30 Church Street, New York, N. Y.

I desire to take advantage of your special pre-publication offer. Please send me the new "Railway Engineering and Maintenance Cyclopedia," in the binding checked.

☐ **Cloth—Special price $5.00**
(regular price $8.00)
☐ **Full Leather—Special price $7.00**
(regular price $10.00)

I enclose remittance to cover—

NAME.....

ADDRESS.....

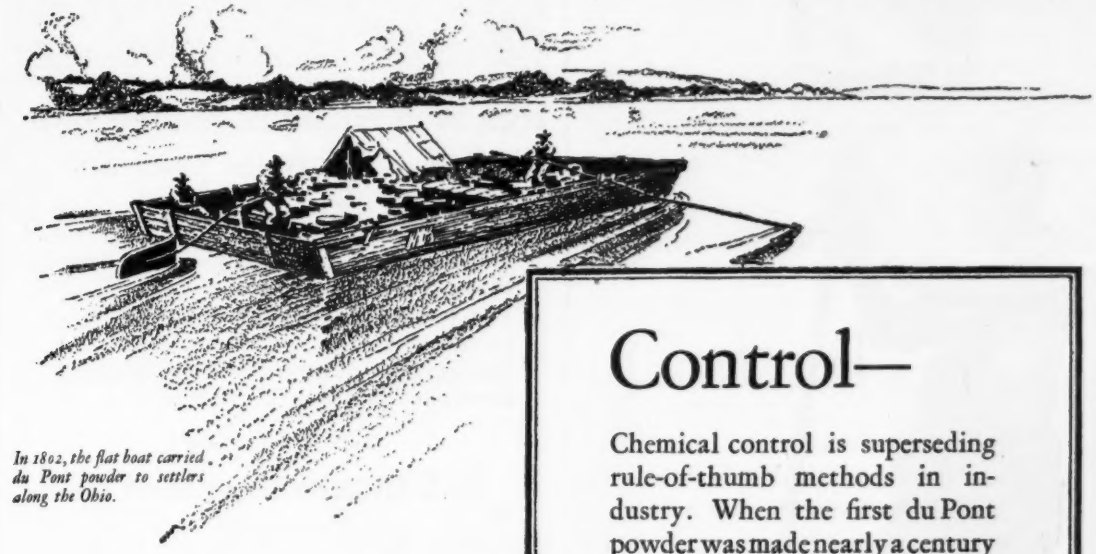
CITY..... STATE.....

POSITION..... ROAD.....

MT 4-26

Simmons-Boardman Publishing Co.
Book Department
30 Church Street New York, N. Y.

MAKERS OF POWDERS SINCE 1802



In 1802, the flat boat carried du Pont powder to settlers along the Ohio.

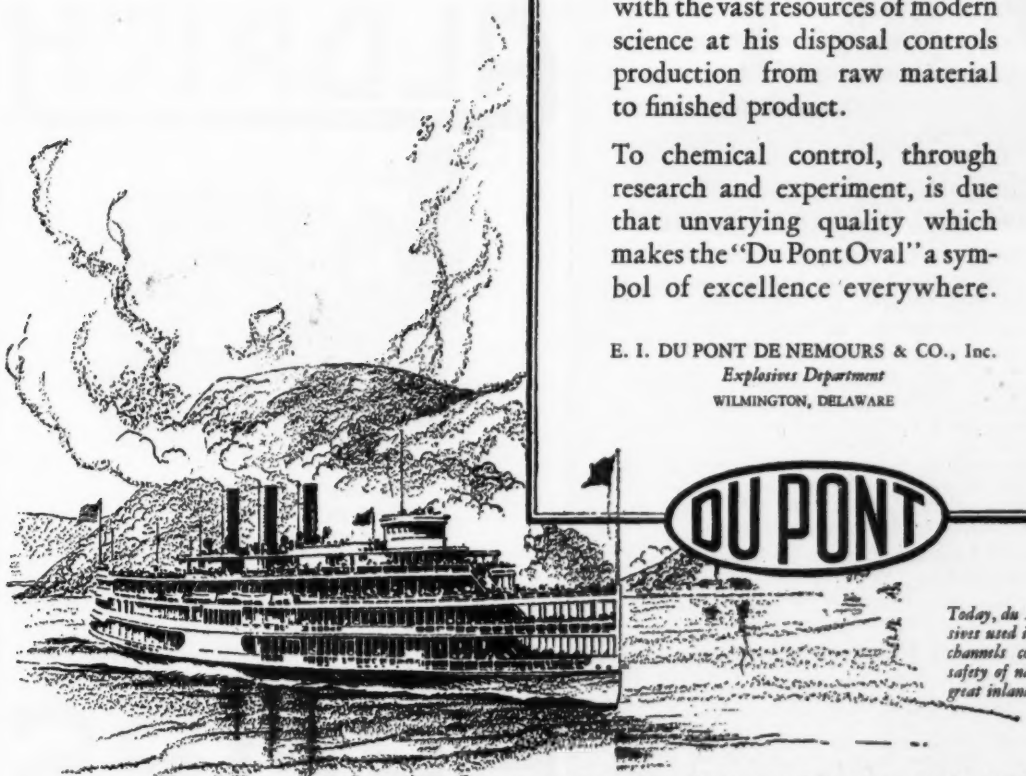
Control—

Chemical control is superseding rule-of-thumb methods in industry. When the first du Pont powder was made nearly a century and a quarter ago—chemistry was not an exact science.

Today, the chemical engineer with the vast resources of modern science at his disposal controls production from raw material to finished product.

To chemical control, through research and experiment, is due that unvarying quality which makes the "Du Pont Oval" a symbol of excellence everywhere.

E. I. DU PONT DE NEMOURS & CO., Inc.
Explosives Department
WILMINGTON, DELAWARE



DU PONT

Today, du Pont high explosives used in deepening river channels contribute to the safety of navigation on our great inland waterways.

123 YEARS OF LEADERSHIP IN THE SERVICE OF INDUSTRY

BLOXHAM
Track Liners

THIS better method of lining tracks reduces maintenance of way costs by eliminating two-thirds of track lining labor.

With little or no digging the Bloxham Liner is set in contact with the foot of the rail and two or three pulls imbed the teeth and move the rail about half an inch. The double bearing—a special feature—enables the workman to shift the lever to the forward notch and take another pull without a second "heeling up." A demonstration can be arranged at your convenience.

Two types—a long base for gravel ballast and a short base for rock ballast.

Write for particulars to

Chicago Steel Foundry Company
DAVID EVANS, President
Kedzie Ave. at 37th St., Chicago, Ill.

W. R. McDonough & Co.
National Building
Cleveland, Ohio

Hubbell & Sharp
1216 Chemical Building
St. Louis, Missouri

W. R. McDonough & Co.
General Motors Bldg.
Detroit, Michigan

S. Douglas Gibson
Suite 744 Transportation Bldg.
Washington, D. C.

J. J. Crawford
Stahlman Building
Nashville, Tennessee
RE&M 4-K-RTG

Extravagant Maintenance Stops When Drainage Goes In

Soft track is a thing of the past on many roads because ballast pockets have been drained with Dickey Clay Socket Sewer Pipe.

Maintenance on these drained cuts gives no more concern than ordinary track. Economy is substituted for extravagance. Savings quickly pay the cost.

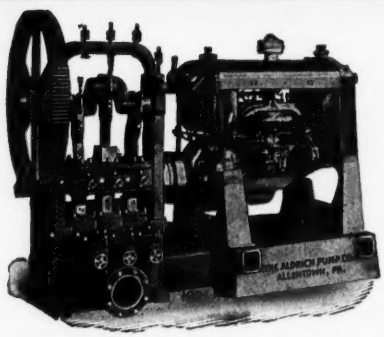
Send for Catalog

W. S. DICKEY CLAY MFG. CO.

Established 1885

Birmingham, Ala.
Chattanooga, Tenn.
Chicago, Ill.
111 W. Washington St.
Kansas City, Mo.
Macon, Ga.
Texarkana, Texas

ALDRICH



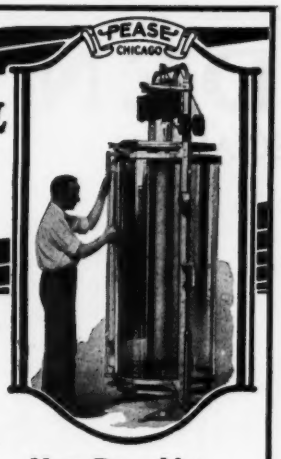
FOR ISOLATED POINTS
WHERE ELECTRIC CURRENT
IS NOT AVAILABLE

THE ALDRICH PUMP CO.
ALLENTOWN, PENNA.

VERTICAL GENERAL SERVICE TRIPLEX
HORIZONTAL HIGH PRESSURE QUINTUPLEX

PUMPS

FASTEST VERTICAL BLUE PRINTING MACHINE



The Pease Vertical Blue Printing machine will turn out a steady supply of perfect blue prints whenever you want them regardless of weather conditions, at a faster rate of speed than is possible with any other equipment of this type.

Absolutely noiseless in operation, the Pease Vertical can be placed in one corner of your drafting room or right in your division offices. So rigidly constructed that it can be shipped anywhere completely assembled without danger of breakage. Prints on either direct or alternating current.

New Pamphlet

"Instructions for Making Blueprints"

Write for your copy of this pamphlet. Tells the complete story of the Pease Vertical and shows how to make perfect blue prints—no obligation.

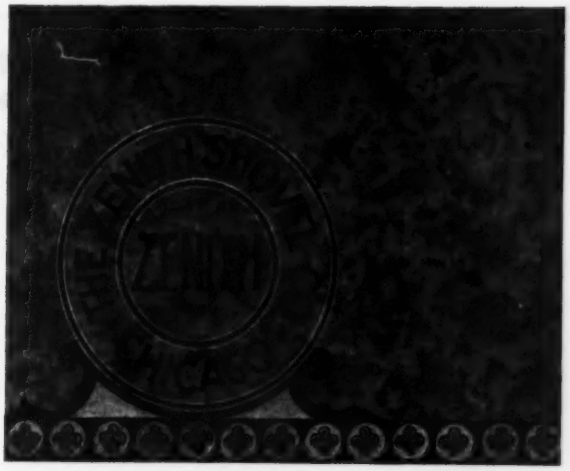
The C. F. Pease Company

854 N. Franklin St., Chicago, Ill.

PEASE

BLUE PRINTING MACHINERY

LET BLUE PRINTS TELL YOUR STORY



-THE SHOVEL WITH A BACKBONE-

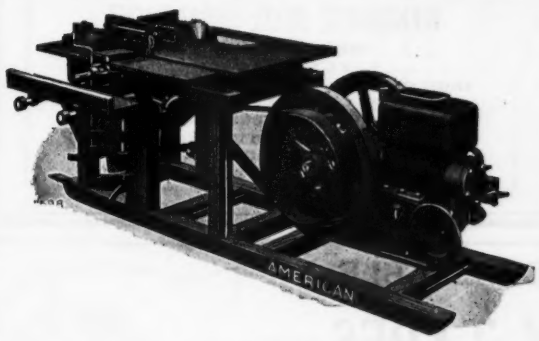
The backbone that doubles the life of a shovel—a cost feature worth considering.

We have issued a booklet "Shovel Troubles Overcome" wherein we explain the "backbone" and its purpose.

There are four weaknesses in shovels, each of which has been corrected in the Zenith.

Write for a copy of the booklet—it is interesting.

AMERICAN COST CUTTERS



Portable Woodworking Machinery for use on the job.

Saw Mills, Woodworkers, Planers, Jointers, Band Saws, Re-saws, Cut-off Saws.

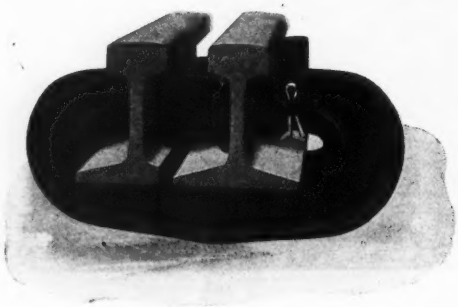
Ask for Complete Catalog

American Saw Mill Machinery Co.

164 Main Street Hackettstown, N. J.

MORDEN

TRACK SPECIALTIES

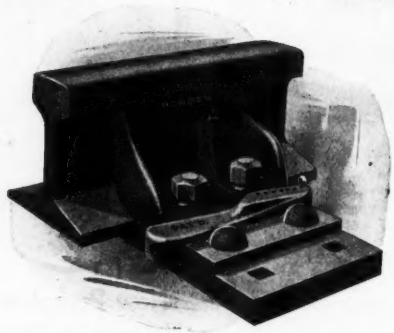


ADJUSTABLE GUARD RAIL CLAMP

A clamp for heavy service with universal drop forged yoke made of special heat treated steel.

This clamp is GUARANTEED. A clamp that is not dependable is expensive at any price.

Made for rails from 80 to 130 lbs. per yd.



ADJUSTABLE RAIL BRACE

A heavy malleable brace for general use on switches, slip switches and guard rails.

Should be in use on all interlocked switches to insure an easy and close adjustment for taking up wear between rail, brace and plate.

MORDEN FROG & CROSSING WKS.

CHICAGO

Manufacturers of

FROGS, CROSSINGS, SWITCHES SWITCH STANDS, GUARD RAIL CLAMPS

All Kinds of Standard and Special Track Work for Steam and Electric Railways

COMPROMISE JOINTS, RAIL BRACES, TIE BARS, DERAILS, SLIDE PLATES, ETC.

The Frog, Switch & Manufacturing Carlisle Company Pennsylvania

Established 1881

FROG AND SWITCH DEPARTMENT

MANUFACTURERS OF
MANGANESE INSERT FROGS, CROSSINGS AND SPLIT SWITCHES
SOLID MANGANESE FROGS AND CROSSINGS
PLAIN FROGS, SWITCHES, CROSSINGS
SWITCH STANDS AND ACCESSORIES

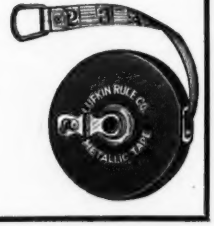
MANGANESE STEEL DEPARTMENT

MANUFACTURERS OF
"INDIAN BRAND"
HIGH GRADE MANGANESE STEEL CASTINGS
FOR FROGS, SWITCHES AND CROSSINGS
JAW AND GYRATORY CRUSHERS
CEMENT MILL, MINING MACHINERY, ETC.
GRAY IRON CASTINGS

STURDY AND RELIABLE

LUFKIN TAPES

In Patterns Best for Every R. R. Requirement—Surveying—Engineering—Construction—M. of W. Steel Tapes with *Instantaneous* Readings and Nubian Finish. **Michigan Chain** (Chicago Style) **Tapes** with ½ gage mark and improved pattern reels.



Among our popular woven lines are the **"Metallic,"** and the low priced tapes for all common uses, the **Ass Skin,** and the **Universal No. 733R Linen Corded** with **First Three Feet Reinforced.**

STOCKED BY RAILWAY SUPPLY AND HARDWARE HOUSES.

Send for Catalogue

THE LUFKIN RULE CO. SAGINAW, MICH.

New York Windsor, Ont.

This Reading Specialties Catalog *should be in your hands*

IT has just come off the press and illustrates the many advantages and economies of the Reading Specialties listed below. These are in use on most of the roads in this and foreign countries.

Send for a copy. Learn how you can lower track maintenance costs.

READING SPECIALTIES

ACCO One-Piece Guard Rails, ACCO Drop-Forged and RESCO Cast Steel Guard Rail Clamps, READING Samson Type Rail Benders, READING Reversible Rail Benders, READING Compromise or Step Joints, READING Car and Engine Replacers, READING Replacer Clamps.

American Chain Company, Inc.

Reading Specialties Division

Bridgeport *Connecticut*

READING SPECIALTIES

District Sales Offices:
Boston, Chicago, New York, Philadelphia, Pittsburgh San Francisco.

Kyrock Station Platform L. & N. Ry.

Kyrock Crossing, P. C. & Y., Pittsburgh

Kyrock

Grade Crossings
Truck Platforms
Station Platforms

ONCE
and forget them

A Kyrock surface will transform worn brick, wood, block or macadam into smooth, resilient pavement, at minimum cost. Easier maintenance thereafter and less of it.

Kyrock is laid **cold.** Stored in the open without damage. It retains its life. Cut it for track repair and the refill bonds under traffic. Perfect waterproofing and non-conductor. Kyrock is foolproof —requires no mixing or heating. Any section crew can lay it successfully without special equipment. It offers you simpler construction, longer life, easier maintenance.

Write today for your copy of "Kyrock for Railway Construction and Maintenance."

KENTUCKY ROCK ASPHALT CO.
Incorporated
Louisville, Ky.

Kyrock The **Perfect Pavement**

KENTUCKY ROCK Kyrock ASPHALT

CELITE

Insures Better Concrete at Less Cost

We Know

that in a large number of cases concrete failures are due to honeycombing and general lack of uniformity in the concrete structures...

that excess mixing water results in low strengths in concrete...

that inasmuch as a concrete structure is only as strong as its weakest section, its strength is dependent not alone on the ratio of the ingredients of the mixture but also on the uniformity of their dispersion throughout the mixture.

WE HAVE PROVED

by field practice represented by concrete construction work in every section of the country (as well as by numerous laboratory tests made by disinterested engineers) that honeycombing and segregation can be entirely eliminated through the judicious use of *Celite*...

that excess mixing water for workability is altogether unnecessary when this "workability admixture" is used...

that *Celite* in a concrete mixture absolutely keeps the individual particles of cement, sand and coarse aggregate in the same relation to each other throughout handling and placing as when they left the mixing drum.

You will be interested in reading how admixtures are employed to reduce the cost and improve the quality of concrete, as outlined in our new Bulletin S-314 on "Admixtures", just off the press.

Write today for this easy-to-read discussion on the important topic of better concrete at less cost.

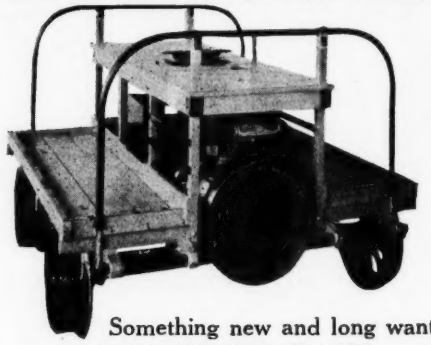
CELITE PRODUCTS COMPANY

11 Broadway New York
53 W Jackson Blvd Chicago
1320 S. Hope St. Los Angeles
Monadnock Bldg San Francisco
Offices and Warehouses

Celite Products Limited
New Birks Bldg Montreal Que.
Celite Products Corporation
London Eng
In Principal Cities

UNIVERSAL POWER CAR

FOR MAINTENANCE-OF-WAY FORCES



Something new and long wanted.

A REAL POWER PLANT

Developing 110 Volts, DC or AC Current to operate the following electric tools:

Grinding Tools
Portable Rail Saws
Track Bonding Drills
Electric Tie Tampers
Flood Lighting Systems
Portable Saws for Carpenters
Boring Tools for Bridge Gangs
Electric Air Compressors for Sand-Blasting and Paint-Spraying
and other electric tools now on the market.

ECONOMICAL, FLEXIBLE, DEPENDABLE

THE EUCLID ELECTRIC & MFG. CO.
EUCLID OHIO
E. J. Correll, 224 So. Michigan Ave., Chicago

LIME-SODA WATER SOFTENERS

We make LIME-SODA WATER SOFTENERS of both the ground operated and top operated types to purify water for prevention of scale deposits and corrosion in locomotive boilers.

There is no investment that a railroad can make which will yield greater dividends, if it operates in a hard water district, than to invest in AMERICAN LIME-SODA WATER SOFTENERS.

At the present time we are installing WATER SOFTENERS on four well-known AMERICAN RAILROADS, on which we made our first installations more than twenty years ago. These plants represent additional repeat orders we have gotten for new plants and enlargements during this time.

Will you please let us have your specifications for water treating plants?

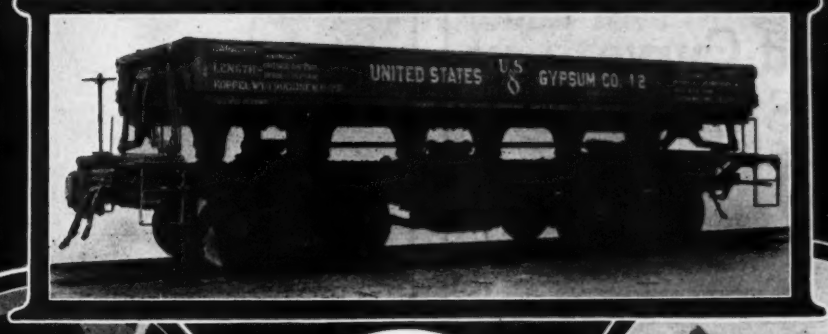
We are qualified by organization and experience to give you service. Write for our literature.

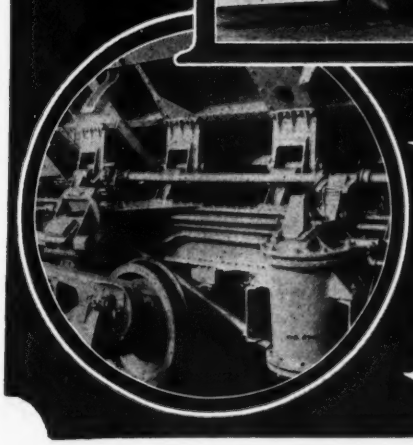
AMERICAN WATER SOFTENER CO.
FAIRHILL P. O. PHILADELPHIA, PA.

Specialists for twenty-four years in Railroad

WATER PURIFICATION

KOPPEL AUTOMATIC AIR DUMP CARS





Have You Seen This Car?

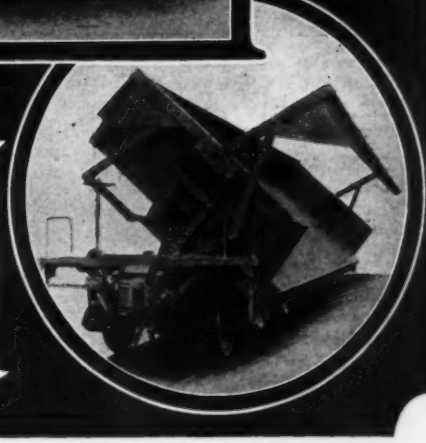
It is without question the greatest value in an air dump car ever offered—more power, clean discharge, well designed—the ideal car.

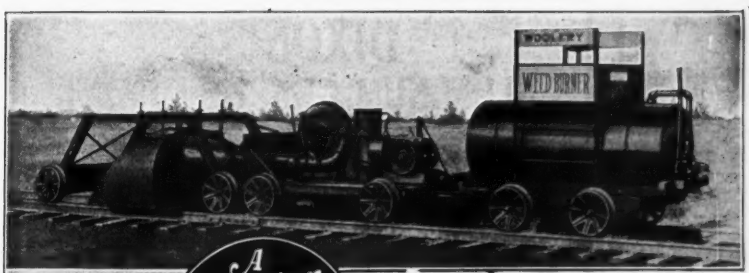
Write for Our Latest Bulletin

Koppel Industrial Car & Equipment Co.

Koppel Penna.

Sales Offices:
Pittsburgh New York Chicago
San Francisco





A **Two-Man** *Outfit of Guaranteed Efficiency Average cost on first heavy burning less than* **$3.00 per mile**

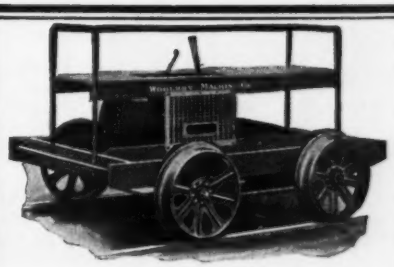
Woolery Railway Weed Burners

(Patent Applied For)

Based on the principle that "A penny saved is a penny earned," a Woolery Railway Weed Burner will make big dividends on the investment for any Railroad having 300 miles of weedy track.

It burns low grade, dark distillate oil.

A Demonstration can be arranged on Your Road.



WOOLERY

Railway Motor Cars and Motor Car Engines

Medium Weight
Extraordinary Strength
Excellent
Safety Features

Made in direct Belt Drive and 2-Speed Bevel Gear Transmission — Power according to requirements—5, 7½ or 10 H.P.

WOOLERY MACHINE CO. *Write for Prices and Further Information* **Minneapolis, Minn.**

A large new edition made necessary by the big demand

3rd Edition Just Out

Simplified Curve and Switch Work

by W. F. RENCH

THE wide-spread demand for this practical book on simplified curve and switch work has made necessary a third big printing.

If you have not yet ordered your copy, mail the coupon now and take advantage of the 7 days' free examination offer to use this popular book for a whole week before actually buying it.

You will appreciate its clear, understandable discussions of various problems, the solutions having been reduced to these simple arithmetical relations, so that the large majority of track men may have at their command a means of meeting practical questions relating to curve and switch work.

You will find included in this book valuable information on string relining of curves, preliminary study of the curve, superelevation of curves and the solution of string lining problems. The spiral, the vertical curve, economics of curves—each of these topics is analyzed in separate chapters. Under practical switch connections you will find the following chapters given detailed attention: Essential elements in the design of switch connections, Rules for computing switch connections, Rules for various functions of turnouts, Practical considerations in installing turnouts, methods in installing and maintaining switches, Simplified field work, Special practices.

Embodied in this book are the practical results of a wide and varied experience in curve and switch work. Its fund of valuable information is needed by every supervisor, road master and foreman and by every man who expects to hold any of these positions.

Your copy of the new 1926 edition will be mailed as soon as we receive the attached coupon, filled in. Mail it today. Take this opportunity to add a wealth of practical information to your knowledge of curve and switch work.

204 pages, 24 illustrations, pocket size, Price $2.00

Simmons-Boardman Publishing Co.
Book Department
30 Church Street New York, N. Y.

Simmons-Boardman Publishing Company,
Book Department
30 Church Street, New York, N. Y.

Please send me post paid for one week's free examination a copy of Simplified Curve and Switch Work. I will either return the book or remit $2.00 within one week.

NAME .....
ADDRESS .....
CITY ..... STATE .....
POSITION ..... ROAD .....
MT-5-26

The
V. G. Flood Light
5,000 C. P.—8 Hours

Once charged. Use it continuously or intermittently for a day or a week.

Tip it over several times.

It will work till that charge is used up.

Safe – Compact

The Universal Generator Co.
Blossburg, Pennsylvania

DIXON'S
ALUMINUM-GRAPHITE PAINT

Prepared primarily to meet requirements of gas, oil and industrial companies and particularly recommended wherever a light colored paint is desired.

Back of this new product stands our century-old reputation, as well as 65 years' experience in paint manufacturing.

Dixon's Aluminum Graphite Paint is composed of aluminum and flake silica-graphite as a pigment and boiled linseed oil as a vehicle. The aluminum is of flake formation and thus easily combines with the flake graphite, lapping over like fish scales and providing covering of unusual elasticity and durability.

The value of flake graphite as a pigment has been thoroughly proven and is generally accepted. The combination of aluminum and graphite results in a paint that is not affected by gases, fumes, and which resists sunlight, air and moisture. Reflecting light and heat, it will keep the temperature of tanks, etc., considerably lower than is possible with darker paints. Ask for Circular 187-AB.

Additional information and prices will be sent upon request.

Joseph Dixon Crucible Co.

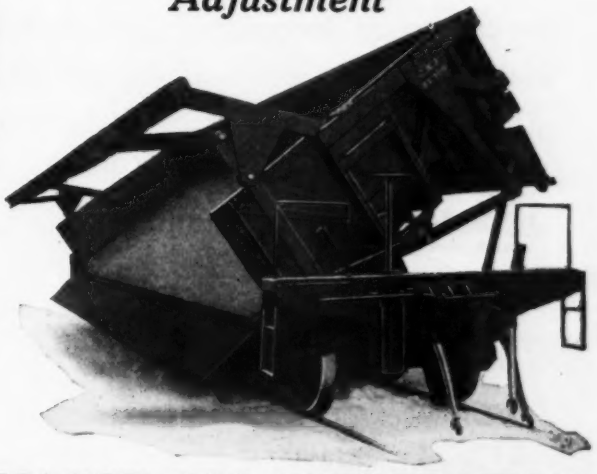
Established 1827 D X N TRADE MARK **Jersey City, N. J.**

MAGOR

AUTOMATIC AIR DUMP CARS

THE Magor Automatic Dump Cars are the results obtained after 15 years of extensive study by expert engineers.
Special features such as "Magor" Positive Compression Locks, "Magor" quick lift door operating levers, "Magor" new design doors with cast steel end frames and extra wide door openings, are combined to assure reliable operation at a low cost.
The dumping cylinders operated by hand rods under end platforms allow the operator to stand clear of track and dump to either side without preliminary adjustment.
Magor dump cars are made throughout to A. R. A. requirements.

Dumps to Either Side Without Preliminary Adjustment



MAGOR CAR CORPORATION

WORKS
PASSAIC, N. J.

30 CHURCH ST.
NEW YORK CITY

Concrete culvert pipe in all standard sizes from 12 inches to 84 inches.

Cattle Passes of 84 inch by 89 inch precast reinforced concrete pipe.

Specialists
in permanent precast reinforced concrete products for railway use

MASSEY
CONCRETE PRODUCTS CORPORATION

Peoples Gas Building, Chicago.
Sales Offices .... New York, Atlanta, Cincinnati, St. Louis, San Francisco, Los Angeles.

CANADIAN CONCRETE PRODUCTS CO. Ltd.
Transportation Building
Montreal

Concrete cribbing for retaining walls is permanent and economical.

Concrete piling of maximum strength is produced by Massey plants.

JORDAN SPREADER

The Composite Spreader-Ditcher, which is the Jordan Spreader with the composite Spreader-Ditcher Attachment, performs all the functions of the Spreader (moves earth, spreads bulky materials, plows snow) and in addition will shape the ballast and subgrade, form new ditches or clean old ones, and trim the banks of cuts to a uniform slope.

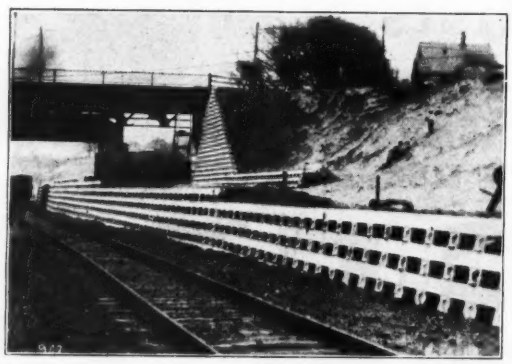
JORDAN SPREADER
"Does the Work of an Army of Men"
SNOW PLOW * ICE CUTTER * UNIVERSAL * STANDARD * DITCHER
O. F. JORDAN COMPANY
WALTER J. RILEY, PRESIDENT
EAST CHICAGO, INDIANA

An all-year Machine. In use on North America's leading railroads.

Write for Copy of New Catalog

LOW COST, EFFECTIVE RETAINING WALLS

R. C. REINFORCED CONCRETE BEAMS



Wherever you have cuts or fills that need flat steep walls use R. C. Concrete Cribbing Beams. They cost less than solid walls and last forever.

Or, if the wall is temporary, tear it down and set up the interlocking beams in any other location they are needed.

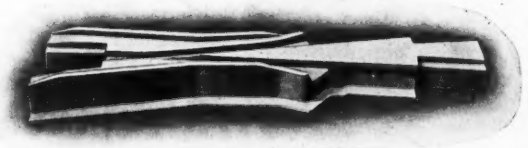
The comparatively low cost of R. C. Reinforced Concrete Beams and the low labor costs of installing make them advantageous anywhere.

Let us tell you more about them.

THE R. C. PRODUCTS COMPANY, Inc.

BRANCH OFFICES: NEW YORK—CHICAGO
ENGINEERS BUILDING CLEVELAND, OHIO

SOLID MANGANESE STEEL



SELF-GUARDED FROG

Combines in one casting the functions of an ordinary frog and two guard rails at no greater cost.

Wm. Wharton Jr. & Co., Inc.

Easton, Pa.

Sales Offices

Boston, Mass.
Chicago, Ill.
El Paso, Tex.
Montreal, Can.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Salt Lake City, Utah
San Francisco, Cal.
Scranton, Pa.

The DURABLE BUMPING POSTS Stop More Than Cars —

1. Excessive Cost of Installation

IT isn't necessary to order out a work train or call on an extra gang to install the Durable bumping post.

It's so easy to understand and so easy to install that any intelligent section foreman with his regular force can put a Durable in service with no appreciable interruption of his regular work.

It requires no excavation, so it can be installed in cold weather as well as in warm.

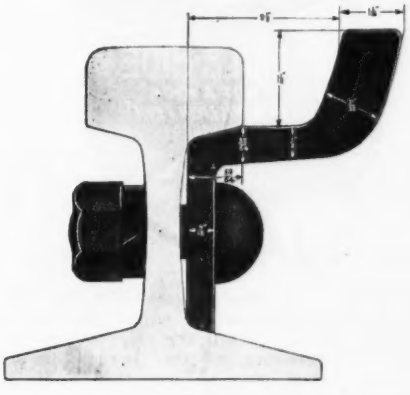
Enjoy the lowest bumping post costs by adopting The Durable.

MECHANICAL MANUFACTURING CO.
Pershing Road and Loomis Sts.
Chicago Illinois

It Stops

1. Excessive Cost of Installation.
2. Waste of Valuable Track Space.
3. Unnecessary Digging Up of Track.
4. Uncertainty as to its Condition.
5. Jeopardy to Valuable Property and Human Life.
6. Trouble in Moving in Winter.
7. Expense of carrying Large Stock of Repair parts.
8. Frequent Renewals.
9. Mistakes in Installing the Post.
10. Carelessness of Trainmen.

Rolled Guard Section 235 G



Rolled Guard Section 235 G is designed for use with standard tee rails on curves and in the manufacture of special trackwork. It has also found general use as a paving guard in paved streets, mill buildings, etc. The use of this guard insures a uniform flangeway for the wheel and protection to the abutting pavement.

Rolled Guard Section 235 G weighs 42 pounds per yard and is rolled to fit an 85 pound A.S.C.E. rail. It is also made to fit other sections.

BETHLEHEM STEEL COMPANY, *General Offices:* BETHLEHEM, PA.

District Offices:

New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh Buffalo
Cleveland Detroit Cincinnati Chicago St. Louis San Francisco Seattle Los Angeles

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

BETHLEHEM

Another Great Achievement in Fence Manufacture

Cyclone
All Copper-Bearing
Steel Fence

Copper-bearing steel, noted for its great resistance to corrosion, is now used in both the fabric and framework of Cyclone Fence.

"Galv-After" fabric and framework All Copper-Bearing Steel Fence, with hot-dip galvanized, is built solely by the Cyclone Fence Company—another example of Cyclone leadership.

The Cyclone Fence Company will erect All Copper-Bearing Steel Fence for yards, shops, terminals, rights of way, or intertrack use, and assume complete responsibility for the finished installation. We also manufacture Wrought Iron Fence. Phone, wire or write nearest offices for new catalog and complete information.

CYCLONE FENCE COMPANY

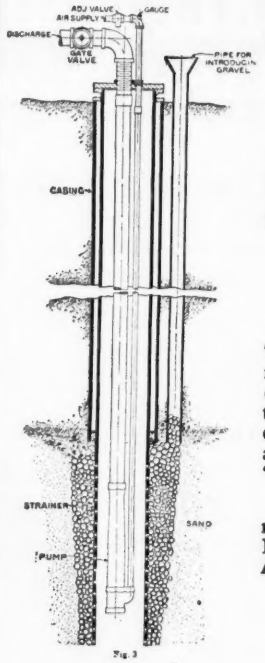
Factories and Offices:
Waukegan, Ill. Cleveland, Ohio
Newark, N. J. Fort Worth, Texas
Pacific Coast Distributors:
Standard Fence Co., Oakland, Calif.
Northwest Fence & Wire Works, Portland, Ore.

©C.F.Co.,1926

The Mark of Quality — Fence and Service

Cyclone Fence

CYCLONE COPPER-BEARING STEEL ENDURES



SHALLOW WELLS

in sand or gravel are a satisfactory source of water supply, when developed and pumped by the

Sullivan Air Lift

The Sullivan method gets rid of sand and places a coarse gravel screen outside the strainer, permanently increasing the volume pumped and preventing further "sanding in" trouble.

Did you see the operating model of the Sullivan "Air Made Well" at the Railway Appliance Show?

Ask for special Air Lift Bulletin 19,128

SULLIVAN TRADE MARK
MACHINERY COMPANY
409 Gas Bldg., Chicago

"NOT A KICK IN A MILLION FEET"

"Out where the West begins"—on the Lincoln Hi-way,—just as one enters the city of Clinton, Iowa, (from the East)—on the spacious warehouse of the Joyce Lumber Company today may be inspected a Mule-Hide roof that has now been in active service since 1908—day by day protecting the valuable contents of this building.

It is interesting to note that in this long interval of eighteen years, only on two occasions has it been deemed advisable to recoat its surface of 550 squares. This practice continued, the life of both felt and saturation will be prolonged indefinitely,—possibly fifty years.

Similar endurance records, conclusively proving the long wearing quality of Mule-Hide, are being established in many other cities thereby suggesting that for lasting satisfaction—buy Mule-Hide first.

THE LEHON COMPANY

Manufacturers
West 44th to 45th Street on Oakley Avenue
Chicago

This shows how the ADSCO Wedge is placed between pipe flanges.

ADSCO
ANGLE FITTINGS

Avoid the expense and inefficiency of bending pipe, cutting crooked threads to get around obstructions.

The ADSCO Adjustable Annular Wedge fits between the bolt circle of standard pipe flanges. This fitting will give you any angle up to 10°. Thousands are used in round houses.

Write for Bulletin 186-RM

AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.
Offices: New York Chicago Seattle

Why Bend Pipe or Cut Crooked Threads?

WHEN PIPING MUST FOLLOW A CIRCLE AS IN A LOCOMOTIVE ROUND-HOUSE
ANY OTHER CURVE CAN BE FOLLOWED AS EASILY

WOODINGS
Forge and Tool Co.
VERONA, PA.

MANUFACTURER OF

TRACK TOOLS

ADZES CLAW BARS
TRACK CHISELS HAMMERS
PICKS SPIKE MAULS
SLEDGES WRENCHES
PUNCHES, ETC.

All Standard High Grade Tools

SPECIAL EQUIPMENT
FOR
REPAIRING TOOLS

GENERAL SALES OFFICE
VERONA, PA.

If

STEEL could be heavily coated with pure asphalt it would be absolutely protected against

LOCOMOTIVE GASES
BRINE DRIPPINGS and
other CORROSIVE AGENTS

HYDRALT!

provides a means of placing such a coating without heat.

HYDRALT consists of fine particles of pure asphalt suspended in water. When spread cold, the water evaporates, the asphalt particles unite, and blanket the steel with a heavy asphalt overcoat.

HYDRALT is the perfect maintenance material for bridges, train sheds, round houses, roofs, etc.

Any workman can apply it — There is no settling; it needs no stirring; it covers easily.

HYDRALT is in successful use on many American and Canadian Rail Roads.

Literature and sample sent on request.

J. B. W. GARDINER, Inc.
Waterproofing Engineers
50 CHURCH STREET
NEW YORK

Buyers' Guide

CLASSIFIED INDEX TO ADVERTISERS

Acetylene, Dissolved.
Oxweld Railroad Service Co.

Air Compressors.
Fairbanks, Morse & Co.
Gardner Governor Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Hoists.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Lift Pumping Machinery.
Gardner Governor Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Anchors, Rails.
See Rail Anchors.

Angle Fittings, Pipe
American District Steam Co.

Anti-Creepers, Rail.
Lundie Engineering Corp.
Verona Tool Works

Ash Conveyors
McMyler Interstate Co.

Asphalt.
Kentucky Rock Asphalt Co.
Lehon Co.

Asphalt Covering
Gardiner Inc., J. B. W.

Ballast Cars.
Rodger Ballast Car Co.

Band Saws.
American Saw Mill Machinery Co.

Ballast Spreaders.
Jordan Co., O. F.
Rodger Ballast Car Co.
Western Wheeled Scraper Co.

Bars.
Bethlehem Steel Co.
Interstate Iron & Steel Co.

Bearings, Axle.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Bearings, Roller.
Hyatt Roller Bearing Co.

Benders, Rail.
See Rail Benders.

Blasting Powders
DuPont de Nemours & Co.

Blasting Supplies
DuPont de Nemours & Co.

Blocks, Hollow Building.
Dickey Clay Mfg. Co., W. S.

Blocks, Flashing.
Dickey Clay Mfg. Co., W. S.

Blueprint Machinery
Pease Co., C. F.

Bonding Outfits, Rail.
Ingersoll-Rand Co.

Bolts.
Bethlehem Steel Co.

Brick, Fire.
Dickey Clay Mfg. Co., W. S.

Buckets.
McMyler-Interstate Co.
Owen Bucket Co.

Buckets, Clam Shell.
Industrial Works.
McMyler Interstate Co.
Owen Bucket Co.

Building Beams, Concrete.
R. C. Products Co., Inc.

Building Papers.
Lehon Co.

Bumping Posts.
Buda Co.
Mechanical Manufacturing Co.

Calcium Carbide
Oxweld Railroad Service Co.

Cars, Ballast.
See Ballast Cars.

Cars, Dump.
See Dump Cars.

Car Dumpers
McMyler-Interstate Co.

Cars, Hand.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Cars, Industrial.
Koppel Industrial Car & Equipment Co.
Magor Car Corp.
Western Wheeled Scraper Co.

Cars, Inspection.
Buda Co.
Euclid Electric Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Motor.
Buda Co.
Euclid Electric Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Section.
Buda Co.
Euclid Electric Mfg. Co.
Kalamazoo Railway Supply Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Spreader.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Cars, Velocipede.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Mudge & Co.
Northwestern Motor Co.

Castings.
Aldrich Pump Co.
Bethlehem Steel Co.
Wharton, Jr., & Co., Inc., Wm.

Cattle Guards.
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.

Cattle Passes.
Massey Concrete Products Corp.

Cement Compound
Celite Products, Inc.
North American Cement Corp.

Chains.
American Chain Co., Inc.

Clamshell Buckets.
See Buckets, Clamshell.

Coal, Ore & Ash Handling Machinery
McMyler Interstate Co.

Coaling Stations
Fairbanks, Morse & Co.

Coating, Asphalt
Gardiner Inc., J. B. W.

Combination Crane Pile Driver.
Industrial Works.

Compressors
Ingersoll Rand Co.
Sullivan Machinery Co.
Gardner Governor Co.

Compromise Joints.
See Joints, Compromise.

Concrete Units, Miscellaneous
R. C. Products Co., Inc.
Massey Concrete Products Corp.

Condensers.
Ingersoll-Rand Co.

Corrugated Iron
Armco Culvert & Flume Mfrs. Assn.

Conveying Machinery
McMyler Interstate Co.

Couplings, Flexible.
Aldrich Pump Co.

Cranes, Barge, Electric, Erecting, Gantry, Locomotive, Pillar, Transfer, Tunnel, Wharf and Wrecking.
Industrial Works.
McMyler-Interstate Co.

Creosoted Timber.
See Timber, Creosoted.

Cribbing, Concrete.
R. C. Products Co., Inc.
Massey Concrete Products Corp.

Crossing Gates.
Buda Co.
Kalamazoo Railway Supply Co.

Crossings, Highway
Kentucky Rock Asphalt Co.

Crossings, Rail.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Morden Frog & Crossing Works
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Crushers, Stone.
Western Wheeled Scraper Co.

Culvert Pipe.
American Casting Co.
Armco Culvert & Flume Mfrs. Assn.
Dickey Clay Mfg. Co., W. S.
Massey Concrete Products Corp.

Curbing.
Massey Concrete Products Corp.

Corrugated Iron.
Armco Culvert & Flume Mfrs. Assn.

Derails.
American Chain Co., Inc.
Q. & C. Co.
Wharton, Jr., & Co., Inc., Wm.

Derricks
McMyler Interstate Co.

Diesel Engines.
Fairbanks, Morse & Co.

Diesel Electric Power Plants
Fairbanks, Morse & Co.

Dieing Machines
Fairmont Railway Motors, Inc.

Ditchers.
Jordan Co., O. F.
McMyler Interstate Co.

Dredging Machinery
McMyler Interstate Co.

Drills, Earth
Buda Co.

Drills, Pneumatic
Ingersoll Rand Co.
Sullivan Machinery Co.

Drills, Rock.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works.

Drill Steel, Rock.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Track.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.

Dump Cars.
Jordan Co., O. F.
Koppel Industrial Car & Equipment Co.
Magor Car Corp.
Rodger Ballast Car Co.
Western Wheeled Scraper Co.

Dynamite
DuPont de Nemours & Co.

Electric Cranes (Locomotive, Pillar, Transfer & Wrecking).
See Cranes.

Electric Light & Power Plants
Fairbanks, Morse & Co.

Electric Power Units
Electric Tamper & Equipment Co.

Engines, Gasoline.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Hoisting
McMyler Interstate Co.

Engines, Motor Car.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Oil.
Buda Co.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Explosives
DuPont de Nemours & Co.

Fences.
Cyclone Fence Co.

Fence Fabric.
Cyclone Fence Co.
Interstate Iron & Steel Co.

Fence Posts.
Massey Concrete Products Corp.
Q. & C. Co.

Fibre Insulation.
Q. & C. Co.

Fibre Angle Pieces, etc.
Q. & C. Co.

Filters.
American Water Softener Co.

Fittings, Sewer Pipe.
Dickey Clay Mfg. Co., W. S.

Flangers, Snow.
Q. & C. Co.

Float Valves
American Valve & Meter Co.
Fairbanks, Morse & Co.

FloodLights
Universal Generator Co.

Floor Coverings.
Lehon Co.

Forgings.
Bethlehem Steel Co.
McMyler Interstate Co.

Frogs.
Bethlehem Steel Co.
Buda Co.
Frog Switch Mfg. Co.
Morden Frog & Crossing Works
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Gages, Measuring.
Lufkin Rule Co.

Girder Rails.
Bethlehem Steel Co.

Governors.
Gardner Governor Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Grading Machinery.
Western Wheeled Scraper Co.

Graphite.
Dixon Crucible Co., Jos.

Grinders, Portable.
Buda Co.
Ingersoll-Rand Co.

Guard Rails.
American Chain Co., Inc.
Bethlehem Steel Co.
Frog Switch & Mfg. Co.
Morden Frog & Crossing Works
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Guard Rail Clamps.
American Chain Co., Inc.
Bethlehem Steel Co.
Frog & Switch Mfg. Co.
Morden Frog & Crossing Works
Ramapo Ajax Corp.
Q. & C. Co.
Wharton, Jr., & Co., Inc., Wm.

Hammer Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hammers, Forge.
Sullivan Machinery Co.

Hammers, Riveting.
Ingersoll-Rand Co.
Verona Tool Works.

Hammers, Steam.
Industrial Works.

Heaters, Feed Water.
American Water Softener Co.

Hoisting Machinery
Fairbanks, Morse & Co.
Ingersoll Rand Co.
McMyler Interstate Co.

Hose.
Ingersoll-Rand Co.

House Lining, Paper
Lehon Co.

Inspection Cars.
See Cars, Inspection.

Insulated Rail Joints.
Bethlehem Steel Co.
Rail Joint Co

Interlocking Switchstands.
American Valve & Meter Co.

Jacks, Bridge.
Buda Co.

Jacks, Track.
Buda Co.
Hackmann Railway Supply Co.
Kalamazoo Railway Supply Co.
Verona Tool Works.

Joints, Compromise.
American Chain Co., Inc.
Bethlehem Steel Co.
Morden Frog & Crossing Works
Q. & C. Co.
Rail Joint Co.

Joints, Expansion.
American District Steam Co.

Joints, Rail.
American Chain Co., Inc.
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.

Joints, Step.
American Chain Co., Inc.
Q. & C. Co.
Rail Joints Co.

Junction Boxes.
Massey Concrete Products Corp.

Knuckles, Emergency.
Q. & C. Co.

Leaders, Pile Driver.
Industrial Works.

Lights, Acetylene
Universal Generator Co.

Lights, Portable, Flood
Universal Generator Co.

Liners, Track.
Chicago Steel Foundry Co
Hackmann Railway Supply Co.
Rail Joint Co.

Lock Washers.
National Lock Washer Co.
Reliance Manufacturing Co.

Locomotives, Oil Engine, Electric Driven.
Ingersoll Rand Co.

Locomotive Cranes.
Industrial Works.

Lubricants.
Dixon Crucible Co., Jos.

Machinery, Grading.
See Grading Machinery.

Manganese Track Work.
Buda Co.
Bethlehem Steel Co.
Frog Switch & Mfg. Co.
Morden Frog & Crossing Works
Ramapo-Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Manholes.
Massey Concrete Products Corp.

Markers.
Massey Concrete Products Corp.

Mile Posts.
Massey Concrete Products Corp.

Meter Boxes.
Dickey Clay Mfg. Co., W. S.

Motor Car Bearings.
Hyatt Roller Bearing Co.

Motor Cars.
See Cars, Motor.

Motors and Generators
Fairbanks, Morse & Co.

Mowing Machines.
Fairmont Railway Motors, Inc.

Nails
Interstate Iron & Steel Co.

Nut Locks.
National Lock Washer Co.
Reliance Manufacturing Co.
Verona Tool Works
Wooding Forge & Tool Co.

Nuts.
Bethlehem Steel Co.

Oil Engines.
See Engines, Oil.

Out Houses.
Massey Concrete Products Corp.

Oxygen.
Oxweld Railroad Service Co.

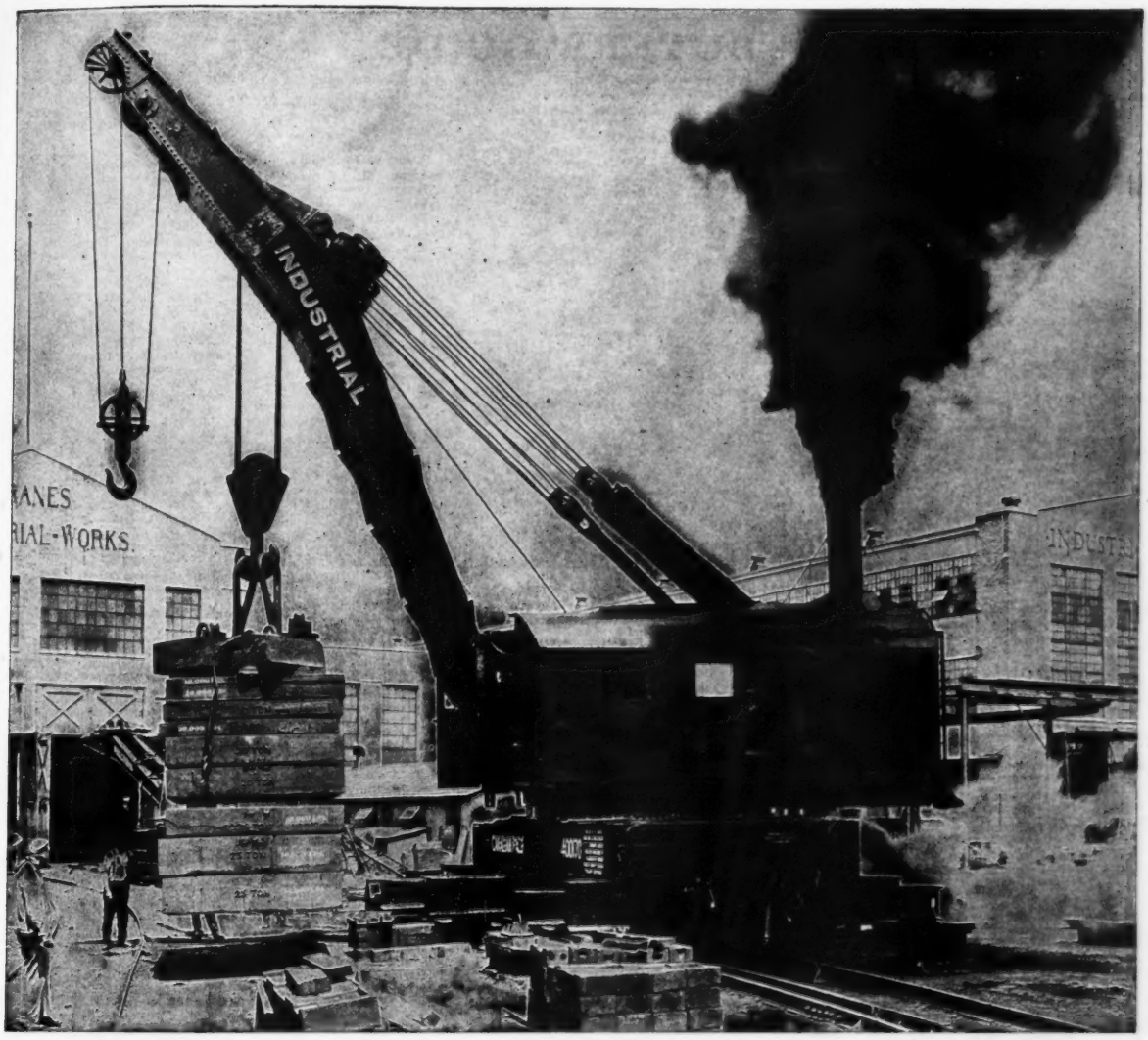
Paint.
Dixon Crucible Co., Jos.

Paint, Metal Protecting.
Dixon Crucible Co., Jos.

Pavement Breakers.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Penstocks.
American Valve & Meter Co.
Fairbanks, Morse & Co.

Pile Drivers.
Industrial Works.
McMyler-Interstate Co.



THE NEW INDUSTRIAL TYPE Y

ABOVE you see the new INDUSTRIAL 175-ton wrecking crane. This was designed and built by the INDUSTRIAL WORKS at Bay City, Michigan, to fill the gap in capacities between the INDUSTRIAL 160-ton crane and the 200-ton wrecker, the largest in the world.

We are sure that this new type Y will fill a long felt want in the railroad field. Many users have expressed the desire for a crane of greater capacity than our 160-ton machine, but not quite so large as the type Z. The INDUSTRIAL type Y is our answer to those requests.

Much interest has already been shown in this latest INDUSTRIAL achievement. We will be glad to send you detailed description of this machine.

Write us today.

INDUSTRIAL WORKS · · BAY CITY · MICHIGAN

BUYERS' GUIDE

Piling.
International Creosoting & Constructing Co.
Massey Concrete Products Corp.

Pipe Carriers.
Massey Concrete Products Corp.

Pipe, Cast Iron.
American Casting Co.
Cast Iron Pipe Publicity Bureau.
U. S. Cast Iron Pipe & Foundry Co.

Pipe, Concrete.
Massey Concrete Products Corp.

Pipe, Corrugated.
Armco Culvert & Flume Mfrs. Assn.

Pipe, Sewer.
American Casting Co.
Dickey Clay Mfg. Co., W. S.
Massey Concrete Products Corp.

Pipe Joint Compound.
Dixon Crucible Co., Jos.

Pipe Wedge, Angle.
American District Steam Co.

Plows, Railroad.
Western Wheeled Scraper Co.

Poles.
International Creosoting & Construction Co.
Massey Concrete Products Corp.

Posts, Bumping.
See Bumping Posts.

Posts, Fence.
See Fence Posts.

Powders
DuPont de Nemours & Co.

Power Plants, Portable
Electric Tamper & Equipment Co.
Euclid Electric Mfg. Co.

Preservation, Timber.
International Creosoting & Construction Co.

Products, Gas.
Oxweld Railroad Service Co.

Pumping Stations
Fairbanks, Morse & Co.

Pumps, Air Pressure and Vacuum, Centrifugal, Deep Well, Piston, Plunger, Rotary, Slump.
Aldrich Pump Co.
American Well Works.
Fairbanks, Morse & Co.
Gardner Governor Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Push & Hand Car Bearings.
Hyatt Roller Bearing Co.

Push Cars.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Mudge & Co.
Woolery Machine Co.

Rail Anchors.
Lundie Engineering Corp.
Verona Tool Works

Rail Anti-Creepers.
See Anti-Creepers, Rail.

Rail Benders.
American Chain Co., Inc.
Buda Co.
Verona Tool Works.

Rail Bonds.
Verona Tool Works.

Rail Braces.
Bethlehem Steel Co.
Morden Frog & Crossing Works
Q. & C. Co.
Ramapo-Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Rail Cranes
Parsons Co.

Rail Joints.
See Joint, Rail.

Rail Saws, Portable.
Industrial Works.
Kalamazoo Railway Supply Co.
Q. & C. Co.

Rail Springs.
Verona Tool Works.

Rammers, Sand
Ingersoll Rand Co.

Removers, Paint.
Mudge & Co.

Replacers, Car
American Chain Co., Inc.
Buda Co.

Retaining Walls
R. C. Products Co., Inc.
Massey Concrete Products Corp.

Rivets.
Bethlehem Steel Co.
Interstate Iron & Steel Co.

Rods, Wire.
Interstate Iron & Steel Co.

Roller Bearings.
Hyatt Roller Bearing Co.

Roof Slabs.
Massey Concrete Products Corp.

Roofing Composition.
Lehon Co.

Rules.
Lufkin Rule Co.

Saw Mills.
American Saw Mill Machinery Co.

Saws, High Speed Friction.
American Saw Mill Machinery Co.

Saw Rigs.
American Saw Mill Machinery Co.
Fairbanks, Morse & Co.

Scales, Track
Fairbanks, Morse & Co.

Scales, Tape
Lufkin Rule Co.

Scrapers, Wheel, Drag and Buck.
Western Wheeled Scraper Co.

Screw Spike Drivers.
Ingersoll-Rand Co.

Section Cars.
See Cars, Section.

Sharpeners, Rock Drill Steel
Ingersoll Rand Co.

Sheet Iron.
Armco Culvert & Flume Mfrs. Assn.

Shingles, Composition.
Lehon Co.

Shovels
Zenith Shovel Co.
Verona Tool Works

Signal Foundations, Concrete.
Massey Concrete Products Corp.

Skid Shoes
Q. & C. Co.

Slabs, Concrete.
Massey Concrete Products Corp.

Smoke Stacks.
Massey Concrete Products Corp.

Snow Melters, Electric.
Q. & C. Co.

Snow Plows
Jordan Co., O. F.
Q. & C. Co.

Special Track Work
Morden Frog & Crossing Works

Spikes.
Bethlehem Steel Co.
Interstate Iron & Steel Co.

Spreader Cars.
See Cars, Spreader.

Spreaders, Ballast.
See Ballast Spreaders.

Standpipes (Penstock).
American Valve & Meter Co.
Fairbanks, Morse & Co.

Stands, Switch & Target.
American Valve & Motor Co.
Bethlehem Steel Co.
Q. & C. Co.
Ramapo-Ajax Corp.

Station Houses.
Massey Concrete Products Corp.

Steel, Alloy.
Interstate Iron & Steel Co.

Step Joints.
See Joints, Step.

Switch Locks.
American Valve & Meter Co.

Switch Interlocker.
American Valve & Meter Co.

Switches.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Morden Frog & Crossing Works
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Switchmen's Houses.
Massey Concrete Products Corp.

Switchpoint Protector
Fleming & Sons Co., Inc.,

Switchstands & Fixtures.
American Valve & Meter Co.
Bethlehem Steel Co.
Buda Co.
Morden Frog & Crossing Works
Ramapo Ajax Corp.

Structural Steel.
Bethlehem Steel Co.

Tampers, Tie.
See Tie Tampers.

Tank Fixtures.
Fairbanks, Morse & Co.

Tank Valves.
American Valve & Meter Co.

Tanks, Water Storage.
Fairbanks, Morse & Co.

Tapes.
Lufkin Rule Co.

Tee Rails.
See Rails, Tee.

Telegraph Poles.
See Poles.

Ties.
International Creosoting & Construction Co.

Tie Plate Clamps
Q. & C. Co.

Tie Plates.
Bethlehem Steel Co.
Interstate Iron & Steel Co.
Lundie Engineering Corp.

Tie Rods.
Bethlehem Steel Co.

Tie Spacers
American Chain Co., Inc.
Co.

Tie Tampers.
Electric Tamper & Equipment Co.
Ingersoll-Rand Co.
Interstate Iron & Steel Co.

Tile, Clay.
Dickey Clay Mfg. Co., W. S.

Timber, Creosoted.
International Creosoting & Construction Co.

Tools, Pneumatic.
Ingersoll-Rand Co.

Tools, Track.
Buda Co.
Hackmann Railway Supply Co.
Q. & C. Co.
Verona Tool Works.
Wooding Forge & Tool Co.

Tools, Wrecking.
Industrial Works.

Tongue Switches.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Ramapo Ajax Corp.

Torches, Oxy-Acetylene Cutting & Welding.
Oxweld Railroad Service Co.

Track Drills.
See Drills, Track.

Track Gages
Bethlehem Steel Co.
Buda Co.
Kalamazoo Railway Supply Co.

Track Jacks.
See Jacks, Track.

Track Liners.
See Liners, Track.

Track, Portable.
Western Wheeled Scraper Co.

Track Scales
Fairbanks, Morse & Co.

Track Tools.
See Tools, Track.

Transfer Tables.
Industrial Works.

Treating Plants, Water.
American Water Softener Co.

Trestle Slabs.
Massey Concrete Products Corp.

Turntables
McMyler-Interstate Co.

Valves, Float & Tank
American Valve & Meter Co.

Ventilators
Q. & C. Co.

Water Columns.
American Valve & Meter Co.
Fairbanks, Morse & Co.

Water Cranes.
American Valve & Meter Co.
Fairbanks, Morse & Co.

Water Softening Plants.
American Water Softener Co.

Water Treating Plants.
American Water Softener Co.

Waterproofing Fabrics
Lehon Co.

Weed Burner.
Woolery Machine Co.

Weedkiller, Chemical
Chipman Chemical Engineering Co., Inc.

Welding, Oxy-Acetylene.
Oxweld Railroad Service Co.

Welding & Cutting Equipment.
Oxweld Railroad Service Co.

Wheels, Hand & Motor Car.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Parsons Co.
Woolery Machine Co.

Windshields.
Buda Co.
Fairbanks, Morse & Co.

Wire
Interstate Iron & Steel Co.

Wire Fencing.
Cyclone Fence Co.

Wood Grapples.
Industrial Works.

Wood Preservation.
See Preservation, Timber.

Woodworking Machinery.
American Saw Mill Machinery Co.

Wrecking Cranes.
Industrial Cranes.

ALPHABETICAL INDEX TO ADVERTISEMENTS

A

Aldrich Pump Co. ... 42
American Casting Co. ... 6
American Chain Co., Inc. ... 45
American District Steam Co. ... 53
American Saw Mill Machinery Co. ... 43
American Valve & Meter Co. ... 18
American Water Softener Co. ... 46
American Well Works ... 16
Armco Culvert & Flume Mfrs. Assn. ... 10-11

B

Bethlehem Steel Co. ... 51
Buda Co. ... 38

C

Cast Iron Pipe Publicity Bureau ... 26
Celite Products Co. ... 46
Chicago Steel Foundry Co. ... 42
Chipman Chemical Engineering Co. Inc. ... 39
Cyclone Fence Co. ... 52

D

Dickey Clay Mfg. Co., W. S. ... 42
Dixon Crucible Co., Jos. ... 48
Du Pont de Nemours & Co., Inc., E. I. ... 41

E

Electric Tamper & Equipment Co. ... 24
Euclid Electric & Mfg. Co. ... 46

F

Fairbanks, Morse & Co. ... 29-30
Fairmont Railway Motors, Inc. ... 4
Fleming & Sons Co., Inc. J. R. ... 8
Frog Switch & Manufacturing Co. ... 44

G

Gardner Governor Co. ... 32
Gardiner, Inc., J. B. W. ... 53

H

Hackmann Railway Supply Co. ... 22
Hyatt Roller Bearing Co. ... 21

I

Industrial Works ... 55
Ingersoll-Rand Co. ... 27
International Creosoting & Construction Co. ... 37
Interstate Iron & Steel Co. ... 9

J

Jordan Co., O. F. ... 50

K

Kalamazoo Railway Supply Co. ... 12-13
Kentucky Rock Asphalt Co. ... 45
Koppel Industrial Car & Equip. Co. ... 47

L

Lehon Co. ... 52
Linde Air Products Co. ... 14
Lufkin Rule Co. ... 44
Lunde Engineering Corp. ... 28

M

McMyler-Interstate Co. ... 31
Magor Car Corp. ... 49
Massey Concrete Prducts Corp. ... 49
Mechanical Manufacturing Co. ... 51
Morden Frog & Crossing Works ... 44
Mudge & Co. ... 3

N

National Lock Washer Co. ... 1
North American Cement Corp. ... 33
Northwestern Motor Co. ... 25

O

Owen Bucket Co. ... 23
Oxweld Acetylene Co. ... 14
Oxweld Railroad Service Co. ... 14

P

Parsons Co. ... 57
Pease Co., C. F. ... 43
Prest-O-Lite Co. ... 14

Q

Q. & C. Co. ... 7

R

R. C. Products Co., Inc. ... 50
Rail Joint Co. ... 34
Ramapo Ajax Corp. ... 17
Reliance Manufacturing Co. ... 2
Rodger Ballast Car Co. ... 35

S

Simmons-Boardman Publ. Co. ... 40-42
Sullivan Machinery Co. ... 52

U

U. S. Cast Iron Pipe & Foundry Co. ... 36
Union Carbide Sales Co. ... 14
Universal Generator Co. ... 48

V

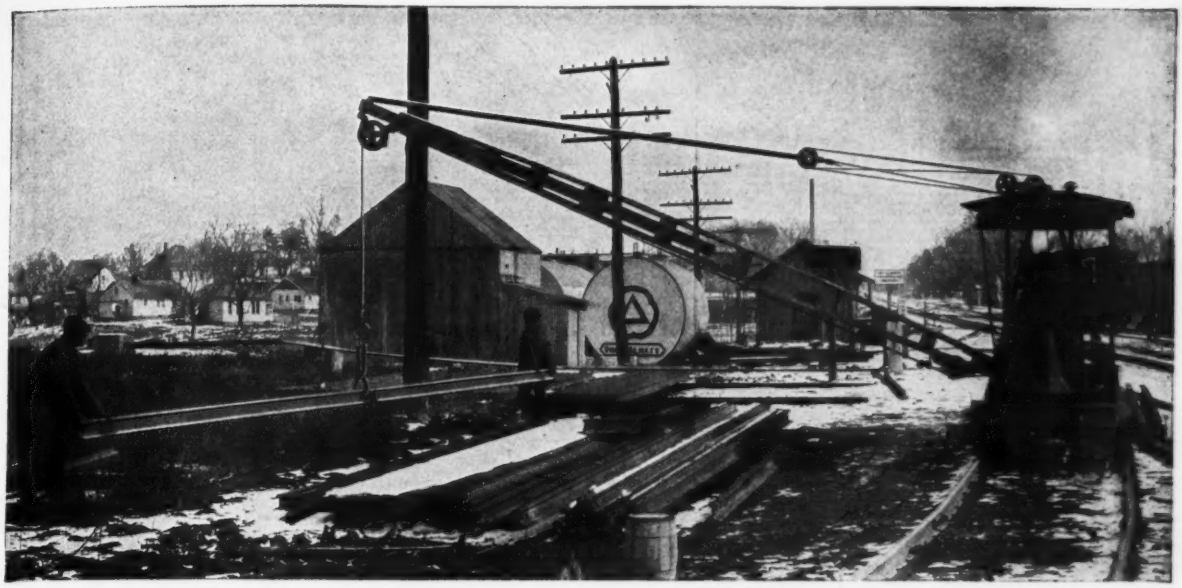
Verona Tool Works ... 19-20-58

W

Western Wheeled Scraper Co. ... 15
Wharton Jr. & Co., Inc., Wm. ... 50
Wooding Forge & Tool Co. ... 53
Woolery Machine Co. ... 47

Z

Zenith Shovel Co. ... 43



Greater Range, Speed, Power

The Parsons Rail Crane Has Important Advantages That Reduce the Cost of Rail-Laying

THE saving that can be made through the use of rail-laying equipment is proportional to the range, the speed, and the power of that equipment.

And in each of these vital points, the Parsons Rail Crane has important advantages which enable it to reduce the cost of rail-laying.

The Parsons Rail Crane meets every requirement of a rail-laying machine, as developed by the experience of maintenance of way engineers. The boom extension to 35 feet, the improved counterweight system, the extra wide wheels—these are typical of the many Parsons features which railroad experience has shown to be most practical.

The improved design of the Parsons Rail Crane, as compared with any similar equipment, has brought about a remarkable saving in weight. And this is reflected by a corresponding saving in cost.

Through the Parsons Rail Crane, you can make a material saving in the cost of your rail-laying program for this season. Bulletin 26-C gives complete specifications. Write for a copy today. You will find it well worth reading.

The Parsons Company
Newton, Iowa

PARSONS RAIL CRANE

DOES THE WORK OF 10 TO 22 MEN

Why trackmen fight for them

We have learned from watching trackmen that they take care of their Verona Shovels, protect them from accident, guard them against abuse, even fight for them. This interest in as commonplace a tool as a shovel is something new in the history of track maintenance.

The reason is obvious. The Verona Shovel makes shoveling easy. Its broad grip and nineteen inch drop are kind to the hands and backs and shoulders of the shovelers. To the man who buys shovels, the long life of the Verona, due to the hard edge and soft back, the depth and strength of the weld, the fit of the handle into the socket, the extraordinary width of the straps and the handle of XX northern white ash is of supreme importance.

But to the man on the track, the first consideration is easy shoveling.

VERONA TOOL WORKS Pittsburgh New York Chicago Boston St. Louis San Francisco
New Orleans Washington St. Paul Denver Baltimore Louisville